SIGNAL

April 1961

Testing SNAP-1A—Systems for Nuclear Auxiliary Power see page 5

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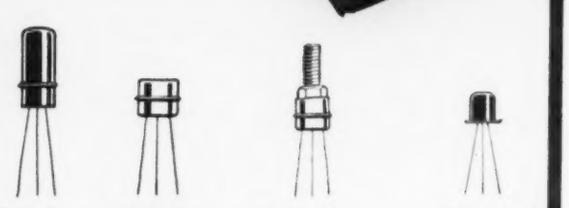

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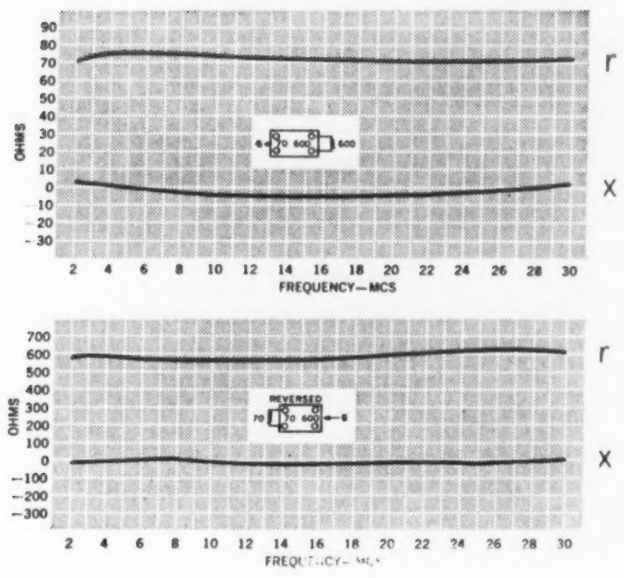

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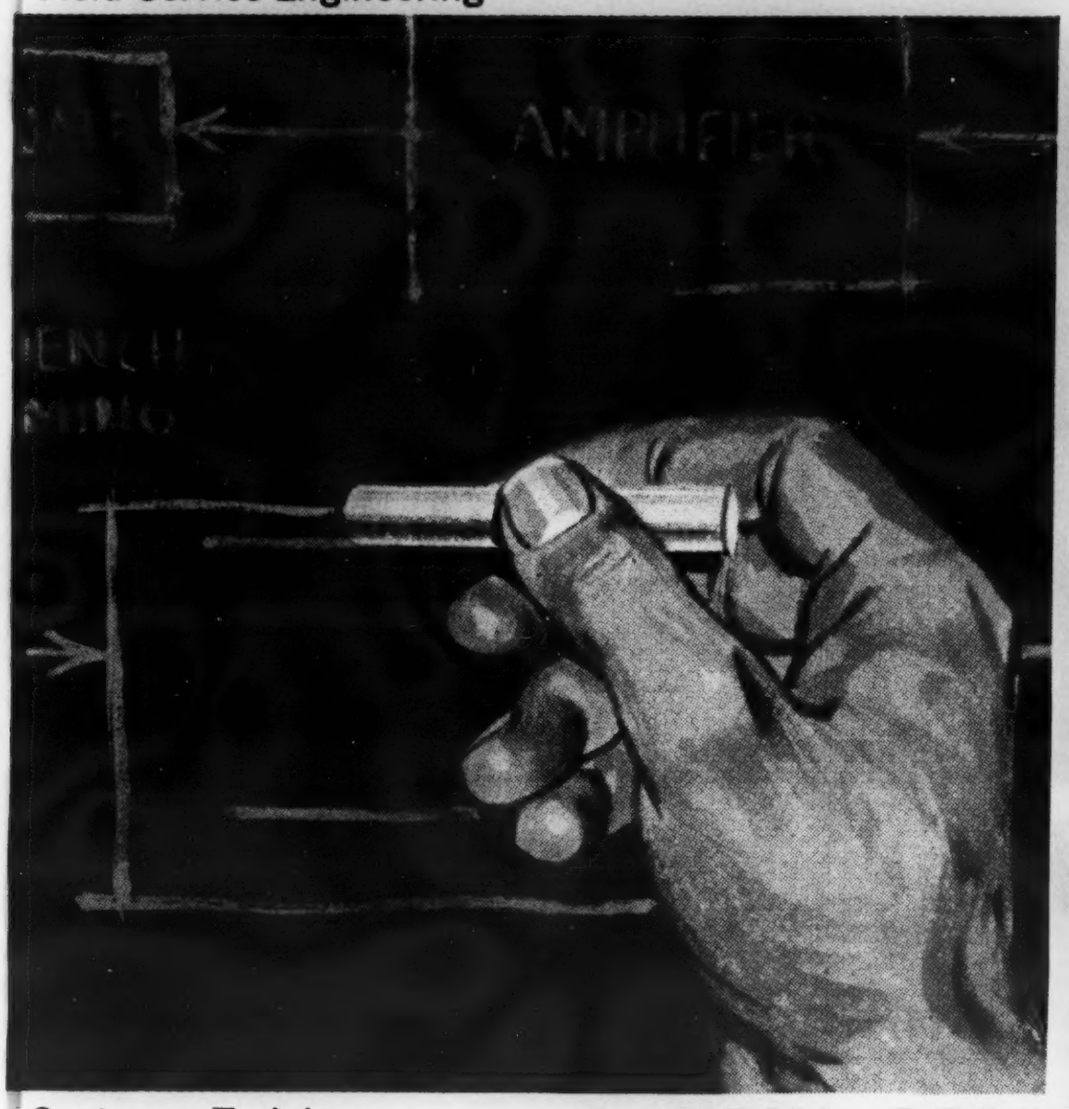

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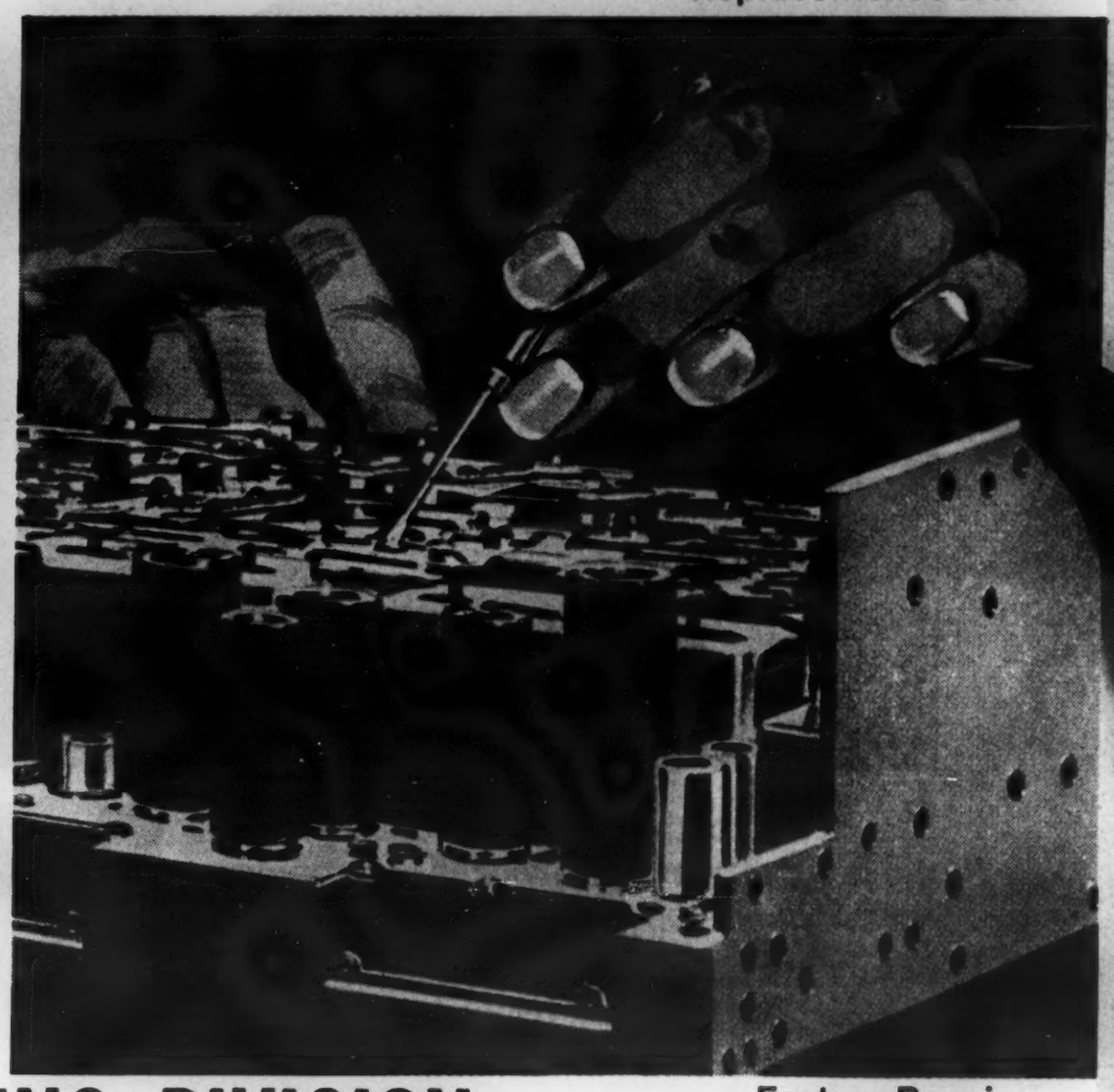

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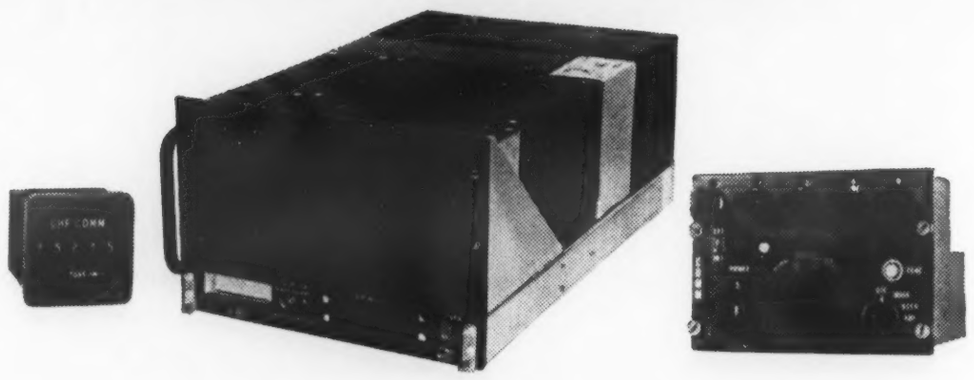

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Communications-Electronics-Photography

Journal of the Armed Forces Communications and Electronics Association

VOLUME XV APRIL 1961 NUMBER 8

CONTENTS

COVER

The experimental reactor, SNAP-1A, is prepared for electrical tests at the Martin Company. SNAP-1A utilizes cerium-144 as the radioisotopic fuel to produce heat. The thermoelectric couples which dot the outer surface of the device then directly convert the heat into 125 electrical watts. A comprehensive two-part article on direct energy conversion will appear in the May and June issues of SIGNAL.

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BPA

There is now a need for specific action on the part of both the military department and industry if we are to obtain the degree of reliability improvement necessary for successful operation of today's complex electronic systems.

RELIABILITY OR PRICE?

by ROBERT C. SPRAGUE

Chairman of the Board, Sprague Electric Company

SO MUCH HAS BEEN SAID on the subject of reliability over the past eight years that it is becoming increasingly difficult to approach the reliability problem from a new or fresh point of view. Thinking about this subject, I decided to review those aspects of the reliability problem which are interwoven with the cost considerations of equipment and system procurement.

In considering this subject I am reminded of a statement made by Dan Noble of Motorola in his talk before the National Aeronautical Electronics Conference May 1960, in which he said: "Reliability is a subject which has gathered a more mountainous accumulation of words in the dead-storage archives of our electronics libraries than any other subject ever considered by scientist or engineer—and with little definitive, effective action, I might add."

These words paint rather a dismal picture, and a dismal picture we will have if we do not take some decisive steps in the area of reliability management. We have come to a point where the effectiveness of the educational approach to the reliability problem is rapidly diminishing. There is now a need for specific action on the part of both the military department and industry if we are to obtain the degree of reliability improvement necessary for the successful operation of today's complex electronic systems. It is certainly essential that everyone connected with developing, designing, producing, testing, installing, operating, and maintaining military electronic gear, be fully aware of the theoretical consideration in the reliability problem, and for this reason I certainly believe that we should continue our reliability education. However, we now have enough knowledge to take dynamic action in many areas which have been defined as areas of weakness in our reliability programs.

We are all sufficiently aware of the effects of inadequate reliability to know that drastic measures are justified to improve the serviceability of military electronic equipment. It has long been appreciated that sacrifices in initial levels of reliability may have to be paid for with higher expenditures for maintenance. This was emphasized in the Rand Corporation study of 1952, which established that it was costing the Air Force about two dollars per year to maintain every dollar's worth of the purchased cost of airborne electronics. (Some informed personnel in the Air Force believe that this relationship is no longer realistic and that current experience is running nearer 60 cents to one dollar per year than two dollars). Since that report was issued, this problem has been under attack by many people from many angles, but the fact remains that during fiscal 1960, procurement of improved weapons was limited by the necessity of applying large sums from available funds to the maintenance of the complex equipment already in operation.

I do not mean to imply here that we have not come a long way since this problem was recognized about a decade ago. Actually, we can point to some very positive achievements since that time, e.g.:

(1) Statistical concepts and techniques have been made available for defining or measuring reliability levels.

(2) Sufficient data have been accumulated to demonstrate that populations of components or systems must be expected to fail in some systematic manner as a function of time.

(3) Progress has been made in applying the principles of mathematical probability to the problem.

(4) It has been more widely recognized that the possibility of equipment failure must be expected, and that the real problem is to find out what the rate of failure is and how this rate can be controlled or reduced.

Management Problems

I would like to discuss a few general management problems which are most significant in the reliability picture. In doing so, I shall emphasize some of the negative and positive factors. Although at times I shall be specific for purposes of illustration, it is not my intention to discuss the problem in detailed fashion. To begin with, I would like to quote from the remarks of Major General Ben I. Funk, the speaker last year at the first meeting of the Annual Reliability Symposium, who said at that

time: "I cannot overemphasize the need for controlling the quality of design as well as controlling the quality of performance. We find, in reviewing failure data from the test sites, that few of our failures result from 'pushing the state-of-the-art'. Many, however, result from simple engineering oversights which could have been prevented with a little forethought."

I would like to suggest that there is another type of oversight that is seriously impeding the attainment of truly reliable weapons systems. This is the fact that our present procurement policies and directives, as are usually applied, do not always result in bidders quoting from the same base. That is to say, procurement terms and specifications are written in such a manner that they cannot or do not receive uniform interpretation by all bidders concerned. Although some contracts are written in a manner which encourages reliability, this appears to me to be the exception rather than the rule. Two examples of programs for weapons systems which are fostering a positive approach to the problem of reliability are the Minuteman and Midas systems; others could be cited.

Problem of Manufacturer

Let us consider the problem facing a manufacturer approaching his responsibility as a bidder for any procurement contract, whether it be for a new weapons system, equipment, component part, or material. He is immediately faced with the choice between bidding on the basis of reliability or on the basis of price. In other words, he faces a choice between the stated objectives of the military departments for greater equipment reliability and the equally vocal demand for a lower price. As a taxpayer, I certainly recognize the valid objective of procuring reliable systems at the lowest cost consistent with system requirements. However, there is a difference between this objective and the all too prevalent practice of sacrificing quality in the interest of lower cost. In other words, I believe that auction block techniques should not be utilized when reliability requirements are sufficiently important to warrant inclusion in the contract.

A bidder, when he prepares his bid, must take into account the qualification and past performance of the people against whom he is competing. If he is bidding against a true cross-section of industry, he realizes that some of his competitors have maintained very high standards as they affect reliability, while others have been willing to sacrifice reliability in the interest of lower cost in order to assure themselves of a portion of the business. As a practical matter, therefore, the bidder must make an economic evaluation of the trade-off between cost and reliability. Since it is a fact of life that there will be all degrees of moral responsibility in the spectrum of potential bidders, it is the responsibility of the military departments and the Department of Defense to develop complete and uniform specification requirements, without loop-holes, so as to insure that all bidders work from the same base.

It has often been said that every contractor has a moral obligation to perform to the best of his ability. Is this a valid assumption? If, in attempting to fulfill this obligation, he attempts to exceed the performance requirements of the applicable specification, he raises his base above that of competing bidders. This being the case, it is necessary for him to limit himself to the level of performance specified, although it might be possible for him to greatly better this performance with attendant improvement in system reliability. If we assume that for these reasons competing bidders will, in general, try to conform as closely to the performance levels of the specification as possible, why then is there a reliability problem if the performance levels spelled out are satisfactory?

We have often been told that improvement of reliability depends upon the development of better specifications. This may be true if we are speaking of the long-term effect, but there are many steps that can be taken to improve reliability on a short-term basis. We need improvement now, if we are to favorably affect present designs. Unfortunately, present specifications can be interpreted in almost as many ways as there are people who read them with a view toward becoming suppliers under them. The loop-holes that make possible such varied interpretations result in large measure from the difficulty of precisely specifying desired performance levels, as well as of setting up test procedures that will accurately reflect the performance actually being obtained. These limitations in the realm of specifying reliability have been recognized in the report of the Ad-Hoc Study Group on Parts Specification Management for Reliability, better known as the "Darnell Report". This excellent study treats the problem of specifications management in the face of insufficient supervisory and personnel support by the military department.

Parts Specification Management

There are many loop-holes in equipment and parts specifications. I will not attempt to cover all of these, but would like to spend a few moments in the area of parts specification management with which I am most familiar. There has been flagrant misinterpretation in the application of the Qualified Products List better known as QPL. Virtually all materials purchased by the military departments are covered by a QPL. These lists are maintained primarily for the guidance and use of military contracting officers; they may also be used for guidance by procurement personnel of military contractors. However, their use by the contractor does not relieve him of the responsibility of determining that the applicable requirements of the specification have been complied with by his vendor. Present practices require that the contractor's purchasing people buy from the lowest bidder on the QPL who is capable of supplying to the quality standards outlined in the specification.

In order to be listed on the QPL a parts or materiel manufacturer need do no more than prove that at one time he was capable of producing a small number of units that passed certain required tests. It gives no insight into the past performance capabilities of either the vendor or the part, and gives absolutely no assurance that future parts, although they may be from the same family, will be capable of meeting the specification requirements. It is obvious then, that the prime contractor must accept the responsibility for guaranteeing compliance with present specifications by the parts manufacturers and institute his own system of checks to make certain that these requirements are complied with. This he is obligated to do, both legally and morally. Once this responsibility is understood, the need for an entirely new specification may often be avoided, since full compliance with the intent of the engineers who prepared the specification may be all that is necessary to reach the required reliability level.

Some contractors and suppliers have been successful in shaving costs by closing their eyes to this responsibility and placing their business with those vendors who are willing to shave their costs, and thereby to lower their price, by neglecting the nec-

essary controls to maintain in regular production the level of quality originally required of them for Qualified Products approval. This is a loop-hole which must be eliminated if all parts suppliers are to operate from the same base. Similar situations also exist, I am sure, at the sub-assembly and system levels.

It has been said that better specifications are required before this problem can be overcome, and I certainly agree that it is important that we incorporate in our specifications the latest techniques of specifying reliability. It has been my experience, however, that we have failed to achieve a uniform procurement base even through the use of the most recent specifications, such as MIL-C-14157B, whose primary purpose is to specify a family of reliable capacitors, because the fundamental specifications and procurement management problems were not clearly understood and dealt with.

My late brother, Julian Sprague, who was Chairman of the Advisory Group on Electronic Parts, pointed to this nearly five years ago when he said, "The first essential ingredients to the achievement of reliability are a basic understanding of the problem and a management philosophy which will dictate the all-out kind of company effort that is necessary. This all-out effort is both difficult and expensive." I think today he would add that we have come a long way toward the basic understanding of the problem, but that we still have a long way to go in developing the necessary management philosophy among those responsible for procurement policies and practices as well as among those of us who have management responsibility in our industry.

Inasmuch as these problems yet remain unresolved, though they have been with us for many years, perhaps a fresh approach is in order. In this connection I fully endorse the recommendation of the "Darnell Report" which would establish approved sources of supply for qualified electronic parts in such a manner as to afford a high degree of confidence that the following criteria will be met:

"(1) That the manufacturer made a quantity of items which met the requirements of the specification at one time and, from all available acceptance inspection records, continues to do so.

(2) That the manufacturer possesses—or has the use of—satisfactory test equipment for all tests required by the specification.

(3) That the manufacturer maintains satisfactory in-plant process control.

(4) That it may reasonably be assumed that a manufacturer so listed will be able to deliver items meeting the specification requirements in a reasonable length of time."

This approach assumes, of course, that the Department of Defense will give the qualifying agency enough stature and funding support so that it will be able to administer the program effectively.

Modified Competitive Bidding

Another approach which has been under discussion for the last two or three years is a system of modified competitive bidding which would incorporate incentives for the contractor to produce to higher levels of reliability. I do not suggest that our system of open competitive bidding be eliminated, but I do suggest that it be modified by limiting bidding to those manufacturers who have demonstrated their ability to produce to required reliability levels. There are a number of ways in which modified competitive bidding can be administered. For example, it has been suggested that a manufacturer be graded on the quality level of his production and on his past record in complying with contractual requirements. Air Force Regulation No. 375-5 goes part way toward suggesting such a system when it states in Paragraph 2a(3): "Contractors reliability capability, both past performance and proposed programs, will be a major factor in all source selection action. . . . If contract reliability requirements are not met, or if the contractor's reliability effort is decreased, the decision to accept or reject the end item or the revised reliability program will be considered with a view toward monetary penalties, unit price decreases, or other considerations deemed equitable."

This regulation suggests penalties of various types for failure to meet performance requirements. Perhaps it would be a greater incentive to the contractor if this were broadened to allow for a greater payment if certain higher reliability requirements were met. Obviously, details of the implementation of any such procedures will require extensive study, but I recommend that responsible officials in the defense establishment address themselves to this or other approaches that give promise of attaining higher levels of reliability, and at the same time of maintaining the uniform procurement base which I believe is necessary if we are to provide the defense program with increasingly complex electronic gear.

I suggest that the next step in bringing bidders to the same procurement base will be to raise this base, using the techniques available to procurement management, and as rapidly as the technical state of the art will permit. Advancements in reliability which might be possible through improved technology can be realized in practice only through the exercise of management prerogatives in this area. We must, of course, recognize that proper consideration must be given to the economic considerations involved, and our goal should not be to improve reliability for reliability's sake. However, once it has been established that improvement is needed we can increase the probability that maximum gains will be achieved by making certain that all who may have something to contribute are invited to compete on an equal footing.

The "Darnell Report," which is over 200 pages in length and discusses only the matter of parts specifications management, certainly indicates the complexity of the problem.

I would like to review the important points covered. First, there have been some significant advances in obtaining a better understanding and definition of the technical considerations of the reliability problem. Second, I have indicated the importance which attaches to uniformity of approach and interpretation of the specification in the bidding process, and have emphasized the need for creating a common base for all potential bidders. Third, I have stressed the importance of procurement management and practices, and have suggested several possible approaches to more effective management. Fourth, I have suggested that after the above steps have been accomplished, and where equipment complexity requires a higher level of reliability, that this common reliability base be raised as rapidly as the technical state of the art will permit.

We are all aware that our reliability goals will not be achieved without paying a price, but our prime consideration should be not one of initial costs, but one of furnishing our country with reliable electronic systems which are vital to our survival. Failure to do so could well mean the end of civilization as we know it today. The challenge is ours.

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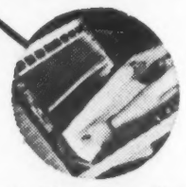

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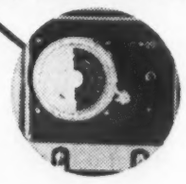

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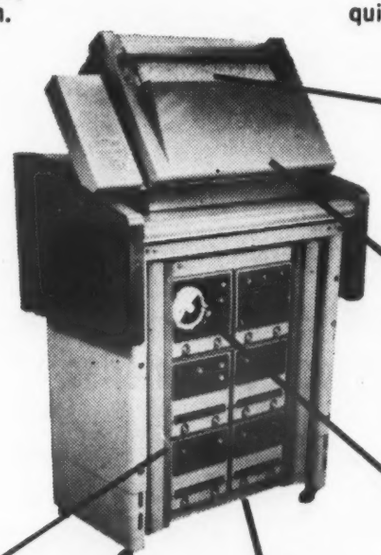

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SOME ASPECTS OF COMMUNICATIONS-ELECTRONICS IN SOUTH AMERICA

■ by RODNEY D. CHIPP
Director of Engineering Planning
ITT Federal Laboratories

DURING A RECENT TRIP to South America, I had the opportunity to look at some aspects of the communications/electronics business in Argentina, Brazil, Chile, and Peru; and to learn first hand the status, trends, and problem areas.

From the trade standpoint, until relatively recently, most South American countries were dependent upon one crop or one product. The development of a more diversified industry was accelerated during World War I; the depression years brought unfavorable trade balances and scarcities of goods, and emphasized the need to industrialize. During World War II export volume increased substantially, and was accompanied by the development of many new industries. Practically every country in South America, since World War II, has placed economic development at a high priority, and has attempted to substantially increase the national production of goods. This has been accelerated by law as well as by incentives. These economic objectives are usually supported by the people, who see in industrialization

(*Continued on page* 12)

vital voice for far east outposts

Okinawa-Formosa Signal Corps Communication Link Completes Pacific System Spanning 400 miles of water, the Far East Scatter System, operated by the Signal Corps, is a highly reliable link in the important Trans-Pacific Scatter System. Alpha personnel engineered the Far East system and provided all site preparation, roads, buildings, antennas . . . as well as the Collins tropospheric scatter equipment. Construction of the stations joining the significant outposts of Okinawa and Formosa took place under the severe topographic and weather conditions of the typhoon-prone Pacific. Field personnel from Alpha are now working side by side with Signal Corps technicians operating this vital multi-channel voice, teletypewriter and data communication link.

Alpha CORPORATION
A SUBSIDIARY OF COLLINS RADIO COMPANY

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a way to raise their standard of living.

There are many ways of gauging the industrial growth of a nation or a continent. One interesting way is to note the ratio of workers to engineers. In the year 1900, in the United States, there were about 250 industrial workers per engineer. Today the ratio is about 60 to 1. It is estimated that South America averages about 200 workers per engineer. Thus we may say that South America is at a stage of industrial progress similar to that of the United States in the period 1910 to 1920.

Another, more conventional measure of growth is the telecommunications industry. As Rear Admiral Ellery W. Stone stated, "The surest index of a nation's economic power today is the degree to which its telecommunications are developed—its per capita use of telephony and telegraphy by wire, cable, or radio, both nationally and internationally."[1] Some growth statistics are given in Table I. There is a lot of solid information packed into this table, and a study of these statistics is rewarding. Certainly they show a potential need for goods and services that reflect the combined effects of population growth and industrial growth.

Communications facilities are being expanded to fill demands that exceed the supply. For example, at the start of 1959 the Compania de Telefonos de Chile had 175,981 telephones in service. During 1959, 16,-540 telephones were installed; yet at the close of the year there was an unfilled demand of 80,424.

In addition to new subscriber sets and the associated central office equipment, the facilities expansion of this Chilean company includes a 24-channel radiotelephone circuit between Santiago and Valparaiso, new automatic exchanges for Concepcion and Recreo, and single-sideband radiotelephone circuits to Antofagasta, Puerto Montt, and Punta Arenas.

Internal communications within each country are arranged in different ways. In some instances, as in Argentina, there is almost complete government ownership. In other cases, as in Brazil, there is a mixture of government and private ownership; the government operates the telegraph system and the bulk of the telephone systems are operated by private companies. Radional provides radiotelephone interconnections to some 20 major Brazilian cities in addition to its service to points outside of Brazil.

Communications among South American countries and to other parts of the world are both private and government. American Cable & Radio Company, RCA Communications, and American Telephone & Telegraph Company are three of the companies which operate some of the principal circuits connecting South American cities with the U.S. and with each other. These cities include Maracaibo, Venezuela; Caracas, Venezuela; Paramaribo, Dutch Guiana; Rio de Janiero, Brazil; Montevideo, Uruguay; Buenos Aires, Argentina; Santiago, Chile; Asuncion, Paraguay; La Paz, Bolivia; Lima, Peru; Quito, Ecuador; Bogota, Colombia. There also are detailed telephone and telegraph circuits within each country, and circuits to countries other than the U.S. Such facilities as these are continually expanding in two ways: service is being extended to new locations, and new types of service such as telephone and telex are being added to locations previously having only telegraph. There are similar and very extensive communication facilities in the Caribbean area and in Central America.

The South American electronic/electrical manufacturing companies have expanded production to meet the increased needs of the companies depending upon them for equipment; as well as to meet new consumer demands for appliances, radio and television sets and industrial equipment. Typical is the Compania Standard Electric Argentina, which produces telephone equipment, radio communications equipment, tubes of all types, TV and radio sets, cable, and industrial equipment.

One can expect to see continued growth of the communications/electronics industry in South America. There are attendant problems—some of them serious, but none of them incapable of solution.

Matters that affect the communications/electronics industry include:

1. Government regulatory measures
2. Availability of trained personnel
3. National custom
4. Product nationalization

Government Regulatory Measures

Government regulatory measures take many different forms. Control of imports may foster local manufacture, but at the same time it can curtail expansion and limit improved quality. Control of communication tariffs, which determine return on investment, can also curtail expansion. For example, expansion plans of the Compania Peruana de Telefonos Limitada were halted in 1959 as a result of a Presidential decree which abrogated parts of the franchise agreement between the company and the government. On the other hand, the fiscal and economic reorganization in Chile has markedly assisted the expansion of its telephone plant, and has, in turn, been reflected in increased activity for manufacturers of equipment. Most South American countries are aware of the importance of these matters, as exemplified by the 1958 report of the Telephone Communication Committee, appointed by former President Kubitschek of Brazil. This report indicated the need for adequate tariffs and earnings to permit companies to expand and improve service, and the development of factories to manufacture telephone equipment.

One must also consider the effect of social legislation, which in some cases has gone beyond that needed to protect the working force. Emphasis is on job security, which often tends to limit initiative and productive output. In one extreme case, in a Peruvian broadcasting company,

[1]Address before the N. Y. World Trade Committee, May 21, 1952.

TABLE I

	North America			South America		
	1949	1959	Increase	1949	1959	Increase
Population (x 10^6)	168	195	16%	112	135	20%
Telephones (x 10^6)	41	72	75%	1.5	3	100%
Telephone Calls to S.A. (x 10^3)	39.2	81.2	107%	----	----	----
Telegrams to S.A. (x 10^6)	1.40	1.64	17%	----	----	----
Telephone Calls to U.S. (x 10^3)	----	----	----	36.2	98.5	173%
Telegrams to U.S. (x 10^6)	----	----	----	1.55	1.64	17%

a sales executive who proved to be unsuited to the job could be dismissed only upon payment of a full year's salary. This dictates the need for extreme care in hiring and promoting. Other (and perhaps more appropriate) legislation stipulates that a certain percentage of the workers in a given industry (in some cases a certain percentage of the payroll) be nationals. This is not difficult to meet except in special cases where a new industry needs considerable foreign (U.S.) know-how and must bring in experienced personnel. Generally speaking, after the nationals have learned to take over, it is more desirable and more economical to operate an enterprise with a minimum number of non-nationals. In a typical operating company (Peruvian Telephone Company) 98% of the employees are Peruvians. In a manufacturing enterprise (GESA) having a total of 7400 employees, only 35 are U.S. citizens.

Availability of Trained Personnel

A problem facing any rapidly growing industry is that of finding trained people. This, of course, is why South America needs, and will continue to need for some time, assistance from North American managers and engineers. There is also a great need for skills at the technician, foreman, and craftsman level. There is a relatively large unskilled labor force created by the influx from country to city, and skilled labor must be recruited and trained from among them. South American industry is (a) using trained people from other countries such as the United States, (b) increasing the scope of the local educational program, and (c) instituting comprehensive on-the-job training programs. Non-nationals brought to South America to work must be chosen with the utmost care and the companies represented must be prepared to employ, as soon as they begin operations, a very large proportion of local personnel. They should fill top jobs with local executives and engineers as soon as these can be trained to fill specific jobs. On the educational front, there is an increase in the number of technician schools (Brazil now has 109) and engineering schools. In the latter, changes in curricula are putting greater emphasis on laboratory work. It is here that the tradition that professionals personally do not handle equipment is being broken down.

General Electric Company has developed a student engineering program, similar to many U.S. cooperative courses, which to date has graduated about 350 young engineers. In-plant training at the foreman and worker level should stress, in addition to job knowledge, safety and maintenance concepts. Safety, as we know it, is very weak in South American industry; it is often considered a costly luxury. The attitude toward maintenance closely parallels that of safety. Serious financial loss through lack of maintenance is common, and intensive education and training are indicated.

National Customs

It may be self evident to say that great importance must be attached to a regard for national customs and practices. Such has not always been the case. As Professor Frank Tannenbaum said: "The objection to American enterprise is not that it is American. Rather it is disliked because it is efficient, purposeful, direct, single-minded and materialistic. In Latin American culture, business is a part of the total scheme of things; it is part of the family, of the compadre relation, of the friendships, of the church. Business is done among friends in a leisurely and understanding way. Material success is at the bottom of the scale."[2]

During recent labor negotiations at a manufacturing plant in Peru, one question of contention was the desire of management to shorten the work day by reducing the lunch period from 3 hours to 1 hour. Most of the workers ate lunch at home—taking bus or trolley one hour each way. Changing this custom required considerable tact and patience, and it was only after a three months' trial that the workers agreed to a plan, which actually got them home 2 hours earlier in the evening and saved them carfare each day. Also, in many plants partially subsidized cafeterias provided substantial low cost meals.

Product Nationalization

An important factor in the industrialization program in Latin America is "nationalization" of the product, i.e., the requirement to produce as much as possible within the country—rather than assemble parts that have been imported. This should not be confused with the nationalization of industry by expropriation as has happened recently in Cuba.

In an automotive plant the value of imported parts was $807 in 1956; it was $23 in 1960.

This pressure to reduce imports by product nationalization has required the use of engineering and production know-how, supplied usually by the United States, and supplemented by a growing local engineering group in each country. In the U. S. many items were purchased at least cost from specialized outside suppliers; whereas in South America it has often been necessary to set up local subcontractors and then teach them quality control, inspection, and measuring methods. In this connection, the U.S. companies have done a great deal to assist in establishing standards which are so necessary in any complete industrial community.

Such additional work has imposed greater burdens on engineers than are customary in this country; in addition to their regular duties, they have substantial activity in incoming inspection and vendor assistance. Adequate specifications for items and materials to be subcontracted sometimes do not exist. Also, lack of facilities to which we give little thought can reduce working effectiveness: inadequate communications and transportation services, unstable power sources, different voltages and frequencies within the same country, no skilled floating labor forces, little specialized technical assistance and few standard catalog parts.

In summary, population growth, industrial growth, and nationalization of product have had a combined effect upon the communications and electronics industries in South America. Industrial growth develops the need for increased communications for commercial purposes, and in addition it fosters urbanization and a higher standard of living. These factors in turn create a demand for more and better communications, for industrial electronic equipment, and for consumer goods. And finally, the desire, stimulated by economic pressure, that a large share of the product be of national origin and manufactured nationally, establishes the need for construction or expansion of manufacturing facilities—and the necessary capital and know-how to implement the need. This is the pattern of communications-electronics growth in South America; it can be aided greatly by material and technical assistance from the United States.

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[2]Page 55, *The United States and Latin America*—Final Report of the Sixteenth American Assembly. Pub. 1959 The American Assembly, Columbia University, New York, New York.

140-foot, self-supporting microwave tower at McGregor Station designed to withstand winds up to 120 miles per hour.

MICROWAVE AIDS TRAINING OF NATO'S MISSILEMEN

by THOMAS E. DANIELS

Military Systems Sales Manager, Texas Division of Collins Radio Company

ONE OF THE WORLD'S busiest missile ranges is installing a range safety and communications system in tempo with its fast moving training program for missilemen of the U.S. Army and other NATO nations. Commonly referred to as an Instrumentation Data Transmission System (IDTS), it will fulfill the complex range requirements for transmission of radar, data, telemetry, timing and communication. The system utilizes Collins Radio Company's microwave carrier and RF equipment.

Fort Bliss, Texas, where 100 years ago muskets cracked, and 50 years ago cavalry charged, now houses the U.S. Army Air Defense Center, whose chief concern is missiles.

Nike Hercules, Nike Ajax, Hawk, Honest John, Corporal, Redstone and La Crosse are foremost among missiles that have pierced the desert sky north of El Paso, since their development at nearby White Sands Missile Range, New Mexico.

Fort Bliss, with its maneuver areas and missile ranges, covers 1,182,000 acres. The more than 25,000 men stationed there are under the command of Major General Sam C. Russell.

Two segments of the U.S. Army Air Defense Center (USAADC) are primarily concerned with the new IDTS: Air Defense Board, which evaluates weapons systems, and the Air Defense School, which is the Army's school for training missilemen, producing technicians, and evolving missile doctrine.

To illustrate the Air Defense School's fast tempo, it graduated 12,400 students in 1959, conducted over 25% of its classes in early mornings or evenings because of a shortage of equipment, printed 5 million sheets of text and constructed up to 25,000 training aids a month.

In addition to the School's missile training, missilemen from more than 400 "on-site" Nike Batteries in this and other NATO countries come each year to Fort Bliss to practice-fire missiles.

The McGregor Range Complex of Fort Bliss extends 58 miles north from El Paso to White Sands, New Mexico. Bounded on the west by the Franklin and Organ Mountains and on the east by the foothills of the Hueco Mountains, the Missile Ranges span a dry level plain 43 miles wide. The horizon is punctured only by isolated mesas which rise a few hundred feet above the desert floor, making excellent sites for radar and microwave stations.

Two basic problems spurred the USAADC Command's decision to install the Instrumentation Data Transmission System, according to Lt. Col. Edwin Paulmann, USAADC Signal Officer.

First was the problem of range safety. The missile ranges are traversed by two main highways, by a railroad and by numerous access roads. The air above the ranges is penetrated by SAC planes from Biggs Air Force Base, adjacent to Fort Bliss; by commercial airliners, and by rancher aircraft. A study showed that from 10 to 95 aircraft fly over the ranges daily.

Second was the problem of dependable communications for operational control of the ranges. Previous communications depended on open wire telephone lines to the ranges with tactical field wire to the radar and launching sites. The line facilities were inadequate for transmitting wideband data, such as telemetry and surveillance radar. Also, they did not offer the flexibility for alternate routing of communications, consistent with current Army communications doctrine.

The USAADC Command felt that an IDTS using either microwave or coaxial cable would solve its problems. Microwave was chosen primarily because it was the less expensive of the two.

In selecting equipment to implement the range IDTS, the Air Defense Center chose Collins Radio Company's 240-channel microwave carrier and RF equipment, because it offers dc power and frequency diversity. These reliability features, the USAADC Command believes, assure maximum range safety and efficiency.

The IDTS is divided into two main subsystems: radar and communications. The communications subsystem is broken into voice, data, range timing, and radar antenna azimuth data. The IDTS will accept and transmit information from various radars such as AN/FPS-8 (early warning radar), AN/FPS-36 (search radar), AN/MPQ-12 (missile tracking radar), and M-33 (missile tracking radar).

Microwave equipment operating in the Government Band from 7125 to 8400 mc is being installed at ten stations. These include the Air Defense Board, Fort Bliss Telephone Exchange, Site Monitor, White Sands Administration Building, Station "C" at White Sands Missile Range, radar sites AN/FPS-8 at Oro Grande, AN/FPS-36 North, AN/FPS-36 South and Range Stations at McGregor and Dona Ana.

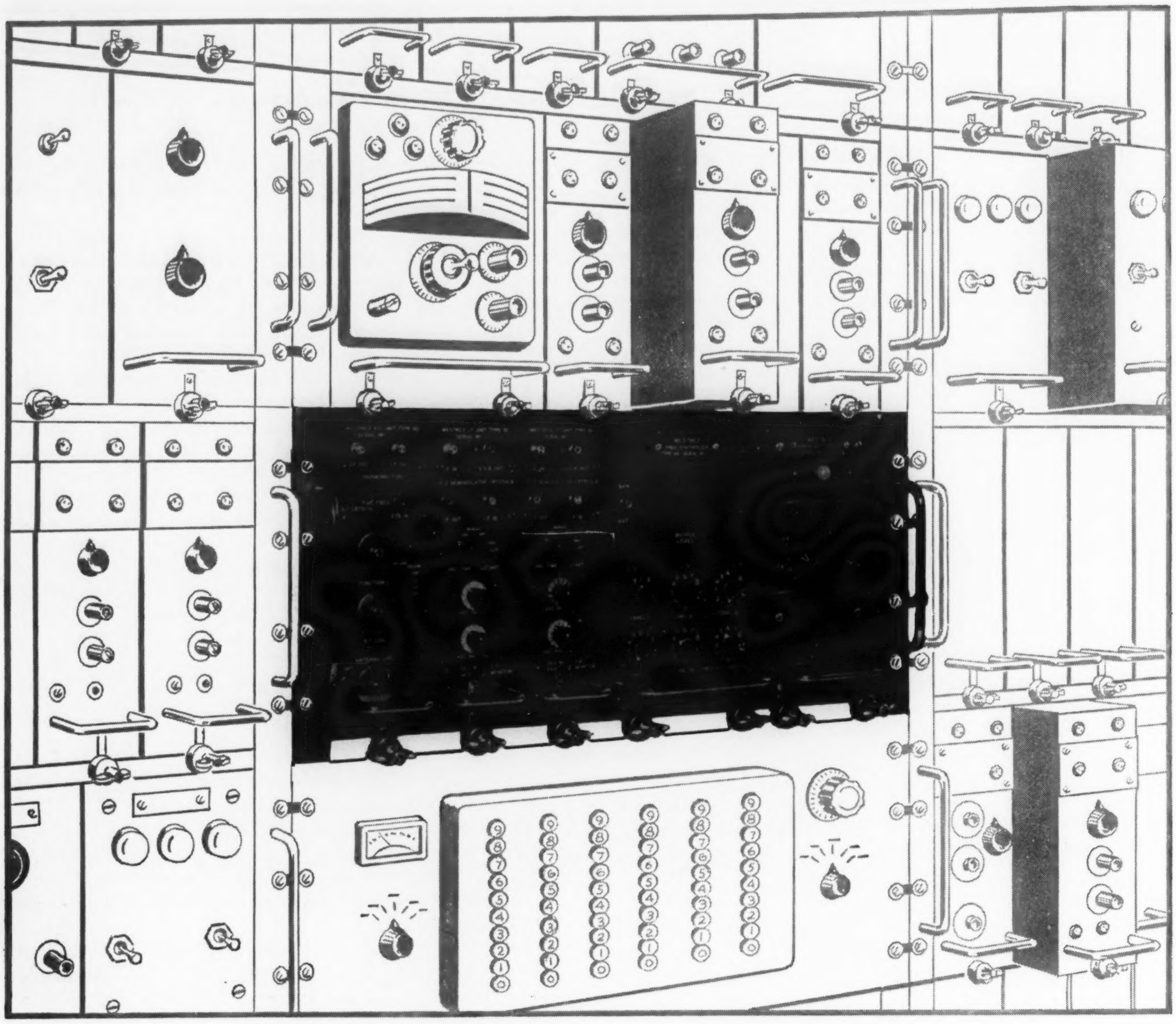
The following information is transmitted, relayed and received at the stations in the system: Voice, Wideband Telemetry Data, Radar Tracking Data, two Range Timing Signals, and Surveillance Radar.

A service channel is included, and a 4-point fault alarm facility is furnished at each site, transmitting all faults to McGregor Station where either a visual or audible alarm is presented.

Surveillance radars were sited by AADC to eliminate blind spots and to provide coverage at 1,000 feet altitude to 45 miles and 20,000 feet to 200 miles. Both Normal and Moving Target Indicator videos are remoted to a Plane Position Indicator (PPI) console in front of the Range Safety Officer at McGregor Station, who coordi-

(*Continued on page* 17)

Col. Charles T. Clark, left, former Ft. Bliss Signal Officer, inspects antennas at McGregor with his replacement, Lt. Col. Edwin Paulmann, center, and Maj. Robert S. Cole, Signal Operations Officer.



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nates surveillance radar observations with FAA and Biggs Air Force Base. The console provides PPI monitoring facilities on a sector scan basis for observation of all aircraft over the ranges.

Thus, the Range Safety Officer has the pertinent information before him to evaluate range safety conditions and withhold missile firings when necessary.

To keep in step with the growth of the fast moving missile field, the IDTS provides for future expansion and can be tied in with other similar systems.

Tracking radars, when tied into the system, will supply data to McGregor Station giving slant range, azimuth and elevation information necessary for plotting. Automatic plotting boards, operating from the tracking radars, will plot space positions of targets and missiles, giving the Range Operations Officer a total picture of the range activities.

The plotting boards will also furnish a permanent scorecard of the missilemen's skill, record the locations of downed targets, and provide a permanent data record for future analysis by Fort Bliss study groups.

Future Uses of IDTS

Other possible future uses of the IDTS are envisioned by the Signal Officer. One of the more unusual possible uses of the microwave might be the transmission of electrocardiograms from the dispensary at White Sands to William Beaumont General Hospital at Fort Bliss. Doctors there could make a diagnosis immediately and return instructions to White Sands, making an ambulance trip from White Sands to Fort Bliss unnecessary.

In tying in with similar systems, the IDTS can be interconnected at Station "C" to the White Sands microwave telemetry system to bring information from the northern-most point of White Sands Missile Range, known as Stallion Peak.

These future uses and numerous others can easily be included in the IDTS, because of the high flexibility provided by microwave. The microwave carrier system achieves maximum channel density by utilizing frequency division, single sideband suppressed carrier techniques to combine individual channels into a composite baseband signal for simultaneous transmission and reception.

Fort Bliss Expansion

As previously mentioned, the Collins microwave system utilizes a frequency diversity technique, which assures maximum reliability by reducing the effect of frequency-selective fading. In this technique, two transmitters beam two signals carrying the same information on two different frequencies from one station to the next.

The two signals are combined by a continuous sensing, ratio-squared, diversity combining unit, which provides a signal-to-noise ratio always equal to or better than that of the better path. With equal signal-to-noise ratios from each receiver, the combined signal-to-noise ratio will be improved 3 db. This combiner provides superior performance to that obtained when a diversity switch is employed. This is especially significant when high-speed, sophisticated data is transmitted. Experience shows that transients caused by diversity switching action will seriously interrupt data presentation.

The system being installed at Fort Bliss will achieve substantial economics not only in providing the facilities necessary for the current training of free world missilemen but also by establishing the basis for future expansion required by the fast moving missile program.

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1N249C	110	20	350	3.6	0.6
1N250C	220	20	350	3.4	0.6
1N1195A	300	20	350	3.2	0.6
1N1196A	400	20	350	2.5	0.6
1N1197A	500	20	350	2.2	0.6
1N1198A	600	20	350	1.5	0.6

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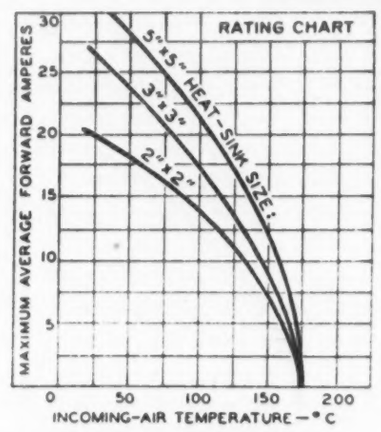
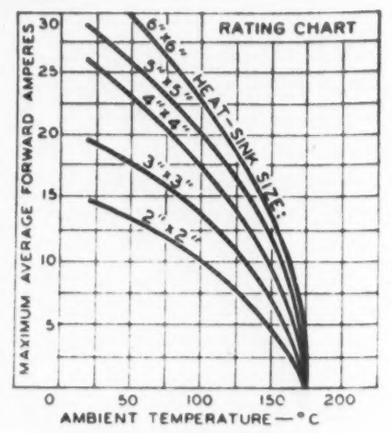


Forced-air cooling: Air velocity = 1000 feet per minute parallel to plane of heat sink.
Single-phase operation.
Rectifier type is stud-mounted directly on heat sink. Heat sink: 1/16"-thick copper with a mat black surface and thermal emissivity of 0.9.



Natural cooling.
Single-phase operation.
Rectifier type is stud-mounted directly on heat sink.
Heat sink: 1/16"-thick copper with a mat black surface and thermal emissivity of 0.9.

NAVY MACHINE TRANSLATION RESEARCH

by
DR. MARSHALL C. YOVITS
Head
Information Systems Branch
Office of Naval Research

MACHINE TRANSLATION Research, which seeks a system capable of translating from one language to another, can be divided roughly into three categories. These are (1) the computer input and output devices, (2) the computer itself, comprising not only the electronic circuitry capable of making decisions but auxiliary memories as well, and (3) the computer program and associated lexical, syntactic, and semantic techniques, enabling the computer to translate languages automatically. Research leading to a completely automatic capability should proceed along all three lines. Of course, research in each of the three categories would have considerable application to the solution of many scientific and engineering problems other than those in machine translation, and might well be motivated by the necessity to solve numerous varied types of problems. Accordingly, investigation in these areas—although of great importance and significance to the machine translation effort—is frequently not supported specifically under this category of research.

Since the very inception of the high-speed digital computer, the Navy has been heavily involved in the support of computers, computer organization, programming techniques, computer technology, and auxiliary computer devices. For example, the Navy supported at least in part some of the earliest and most imaginative attempts to build high-speed digital computers—such as the Harvard Mark II and Mark III computers, the Institute for Advanced Study computer, the Whirlwind computer, the Naval Ordnance Research computer, and the George Washington University Logistics Research computer. These computers provided much of the technology and organization for existing and proposed high-speed computers so necessary for machine translation. Currently, the Navy is sponsoring, at least in part, a number of the newest and most advanced high-speed computers—such as the Remington Rand LARC, the Philco TRANSAC, and computers at the University of Illinois and the University of California at Los Angeles. Also the Navy is supporting million dollar contracts at IBM, Sperry Rand, and the Radio Corporation of America to consider novel technology for the design of computers that operate in a billionth of a second.

In regard to the question of auxiliary computer components, particularly high-speed, high-density memories, ONR has always heavily sponsored and currently continues to sponsor research in these areas. These high-speed, high-density memories will be of great use in their application to machine translation problems. They include a novel photomemory of considerable potential.

Computer input and output devices have been recognized by the Navy as an area of the greatest importance, insofar as the use of computing techniques is concerned. Both ONR and the Bureau of Supplies and Accounts have been actively concerned with research in this area. The Navy now supports a number of research projects which will lead to computer input devices that should be able to read rapidly and easily a large variety of different type fonts as well as —eventually—handwritten characters. With regard to computer output devices, the Navy has supported work which led to the now widely used Stromberg-Carlson high-speed printer, capable of printing 5000 lines per minute.

Support of Other Agencies

The computer program and associated linguistic research have been recognized by the Navy to be very adequately supported by other agencies, particularly the Air Force, the Army, the Central Intelligence Agency, and the National Science Foundation. The Navy currently supports research in machine translation of a general, critical nature at Hebrew University in Israel and at Wayne State University, where a small group is considering the translation of mathematical literature from Russian to English. The latter group cooperates very closely with groups at Georgetown University under CIA sponsorship and at Ramo-Wooldridge under Air Force sponsorship. From 1952 through 1956, the Navy supported a basic study of Russian linguistics also at Wayne University. This resulted in a most important book by Professor Harry Josselson, *The Russian Word Count.*

Machine translation is one facet in the communication sciences consisting of artificial intelligence, communication biophysics, communication systems, experimental psychology, linguistics, neurophysiology, processing and transmission of information, sensory aids for the handicapped, social science, and speech communication. Research in all of these fields is currently supported by the Navy at M.I.T. and elsewhere, and advances are expected to have a strong bearing on progress in machine translation.

The reasons for Navy support of machine translation and auxiliary projects are:

- First, good machine translation would be of great and immediate value to ONR. Much of the information used by the Office of Naval Intelligence arrives in one foreign language or another. Acceptable automatic translation not only would increase manyfold the amount of raw data which could be ingested, but also could improve the accuracy and consistency of available English translations. Perhaps most important, competent analysts would be freed from the necessity of personally translating documents which they need quickly, thus leaving additional time available for the more abstract aspects of intelligence analysis.
- Second, the Navy has a very great interest in the translation to English of foreign scientific and engineering literature. The Navy spends many millions of dollars annually in discovering and developing new devices and methods. Wide availability of pertinent foreign information could easily shorten the development periods required and reduce the money spent on work already accomplished elsewhere.
- Third, machine translation is a most exciting application of high-speed computer technology. As has been mentioned, many of the problems involved in machine translations are common to a number of fields of information processing, so that progress in one field results in progress in the others, as well as giving additional insights into the solution of problems in other fields.

LETTERS TO THE EDITOR

Editor's Note: *Since the Adairs' "Proposal for Pan American Telecommunications" appeared in* SIGNAL, *we have received the following on methods of establishing such a system.*

Satellite Communications

Dear Sir:

In the October 1960 issue of SIGNAL, George and Evelyn Adair presented an interesting and timely "Proposal for Pan American Telecommunications." In these times of Communist penetration of Cuba, and of disturbances elsewhere, the United States should become a true Good Neighbor to our sister republics by taking the lead in improving hemispheric communications.

The Adairs suggested a complex network of microwave and tropo-scatter links, as shown by their map on page 8. They recognized many of the difficulties of such a project, including the dangers of expropriation, and of interruption from revolutions. Many of these dangers vanish and the difficulties and costs decrease when one introduces stationary satellite communication as the backbone for this Pan American system. Such a system interconnects its many terminals directly through the satellite, and thus *jumps over* any trouble spots, such as Castro's Cuba. And, if the terminals are sold to the countries served, there could be no expropriation problems.

With the proposed chain of microwave and tropo-links there would be problems in persuading certain nations in the chain to meet the high transmission and switching standards required for such long chains. Completion of the system would be too slow to be effective, unless the United States paid most of the costs. By analogy, the Pan American Highway is a chain of roads, which has been under construction for about twenty years, but it still has gaps. Many sections are excellent, but others only are excellent for local ox-carts! A satellite system is not such a chain and would provide communication between any two terminals which met the system standards.

With a satellite backbone for the system, there still would be need for microwave and other surface communication networks to serve the earth-terminals, and to supply internal and medium-distance communication. Intercontinental communication could start, however, while these terminal networks were growing. In time, when these networks grew to meet each other, they could provide an emergency back-up to the satellite system.

Interference-control is another important consideration in satellite communication. Studies by an EIA Technical Committee last spring, for FCC Docket 11866, established the feasibility of satellite communication sharing frequencies with surface point-to-point microwave systems. A paper based on this study was presented at the Montreal Communication Symposium, Nov. 5, 1960. The point of interest in relation to a Pan American system is that interference susceptibility (to or from a satellite) is predominantly within a narrow tangential belt at the satellite's earth-horizon. 100° west would be an excellent Pan American satellite location.

Couldn't some Communist power destroy the satellite or, at least, jam it? Possibly, though this would be more difficult and expensive than many people realize. Destroying the satellite system would not serve the communists' interests because it would put them in disfavor with the nations they would like to penetrate.

Is a satellite system practical? Could it be operational within a few years? If not, the chain of microwave and tropo-links might be the best we could do, but years would be consumed in its planning, organizing and installation. Dr. Harold Rosen described the Hughes communication satellite at the American Rocket Society meeting, Dec. 8, 1960. He is confident that it could be put in operation within a year. Even if a different satellite were chosen and developed on a slower schedule, it could be operational between remote terminals long before a surface communication network would be completed. But should we wait to develop a different satellite? Castro and his supporters aren't waiting!

The recent rash of revolutions suggests that time is running out for effective aid. Such aid must be prompt, and is apt to be expensive in terms of what it accomplishes—if it just follows the pattern of prior foreign aid programs. Our Government's share in the cost of a Pan American satellite communication system could be but a negligible fraction of what otherwise need be donated. Could such aid be better spent? How could our prestige be better enhanced than by taking the lead in building this "out-of-this-world" international system? What effect could Communist propaganda have against Pan American pride in being bonded together by a little black box far out in space, marked "Made in U. S. A."!

S. G. LUTZ
Senior Staff Member
Hughes Research Laboratories

Editor's Note: *Mr. Adair's comments below were received as we went to press.*

Speed Required

Dear Sir:

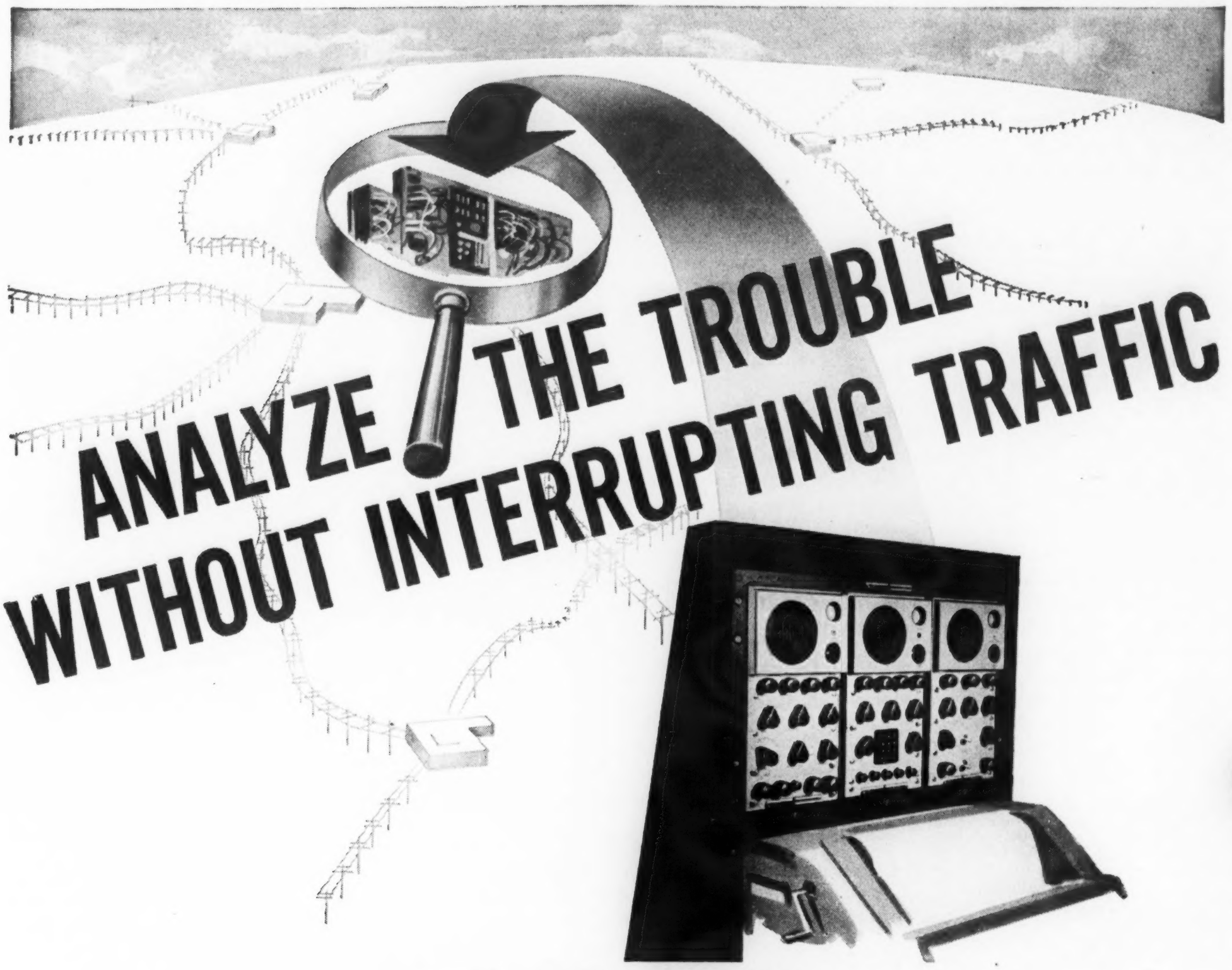
We are in 100 per cent agreement with Dr. Lutz that the important thing is to get a Pan American Telecommunications System established employing the latest and most suitable technical means or the best combination of them. Unless things move faster in the future than they have in the past all of the presently known techniques may be obsolete. This assumes of course that there is enough left of the Western Hemisphere by that time to need a telecommunications system. Time is fast running out and it is almost certain that unless positive and adequate action is taken soon, it will be too late.

The responsible officials in all of the Pan American countries should establish a proper organization, adequately financed, on a crash basis. They should immediately assign technical, economic and legal staffs of top quality to make studies, surveys, plans, treaties, recommendations and other necessary activities looking toward the establishment of the system at the earliest possible date.

The technical groups can determine on the basis of their findings what are the best techniques to use for each part of the system. Any small differences as to the best method is of little consequence. The important thing is to get it off the ground.

Over the years international conferences have been held on this subject, but as indicated by reports and minutes, few if any of the delegates had authority to agree to anything. These were largely technical conferences—which is placing the cart before the horse. High level officials

(*Continued on page* 22)



ANALYZE THE TROUBLE WITHOUT INTERRUPTING TRAFFIC

how to reduce down-time on telegraph and data transmission circuits

Radiation's new Telegraph Distortion Monitoring System (TDMS) provides in one compact assembly complete testing, monitoring and signal waveform analyses of telegraph circuits and data transmission lines. This versatile unit makes possible on-line quality control of communications links. It indicates malfunctions, analyzes their causes—without interrupting the flow of traffic.

The Radiation TDMS, with miniaturized components for space-saving compactness, can replace most test equipment now required for teletype maintenance and monitoring. Thus, in addition to reducing circuit outage, the TDMS permits reduction of test equipment costs and increases maintenance efficiency. Portability is achieved at the "push of a button".

For a detailed description of the operation and capabilities of the TDMS, write for Brochure RAD E-100B. Address Radiation Incorporated, Dept. S-4, Melbourne, Fla.

THE ELECTRONICS FIELD ALSO RELIES ON RADIATION FOR . . .

RADIPLEX—50—channel low-level multiplexer with broad data processing applications. Features rugged solid-state circuitry, almost unlimited programming flexibility, unique modular construction for compactness and exceptional ease of operation and maintenance.

RADICORDER—Multistylus recorder provides high-speed instantaneous readout for wide range of data acquisition or processing systems. Eliminates necessity of electronically translating complete data, thereby reduces computer work loads.

TELEMETRY TRANSMITTER—Model 3115 is a ruggedized 215-260 MC unit with extremely linear FM output under the most severe environmental conditions. With its record of outstanding performance in many missile programs, Model 3115 is specified by leading missile manufacturers.

RADIATION INCORPORATED

Letters to the Editor

(*Continued from page* 20)

must provide the organization and the money first. The technical and other details can be readily solved after that. It is most sincerely hoped that the responsible officials will take immediate and effective action.

GEORGE P. ADAIR
George P. Adair Engineering Company

Military Interference Coordinators

Dear Sir:

I have just read Mr. Turner's fine article, "An Insurance Policy Covering RFI," in the January issue of SIGNAL, as well as your "editor's note" expressing AFCEA interest in the Cooperative Interference Committee Program.

In elaboration of the CIC Program, I would like to mention the effective work being done by the Area Frequency Coordinators maintained by the military services at their test ranges. The problem of radio frequency interference and inter-action between electronic equipment is probably nowhere greater than at the missile test ranges. To deal with this critical problem, Area Frequency Coordinators have been established at the Pacific Missile Range, Pt. Mugu; at White Sands Missile Range, New Mexico; at the Army Electronic Proving Ground, Ft. Huachuca, Arizona; and, at the Atlantic Missile Range, Cape Canaveral, Florida. The Pacific Missile Range Coordinator, maintained by the Navy, is responsible for the area enclosed within a radius of 200 miles of the Administration Building at Pt. Mugu; the White Sands Coordinator, maintained by the Army, is responsible for the area comprising the State of New Mexico and other U. S. territory within 150 miles radius of the Headquarters Building at White Sands; the Ft. Huachuca Coordinator, also maintained by the Army, is responsible for the entire State of Arizona; the Atlantic Missile Range Coordinator, maintained by the Air Force, is responsible for the areas within a radius of 200 miles of the Headquarters Building at Patrick and Eglin Air Force Bases.

Basically, these Area Frequency Coordinators are responsible for coordinating military frequency usage at the respective test ranges and within the areas delineated in the preceding paragraph, if there is a possibility of harmful interference being received from or caused to test range operations. The Area Frequency Coordinators maintain detailed records of frequencies used in their areas and provide a most valuable service to those responsible for communications-electronics operations. They have proved to be very resourceful in arranging time sharing of frequencies, recommending technical adjustments of equipments, and tracking down interfering signals. It is hardly necessary to emphasize the vital role played by those responsible for radio frequency interference control during a count-down or missile launch.

The duties of the Area Frequency Coordinator are very demanding and require highly competent personnel to carry them out. The Coordinator maintained by the Navy at the Pacific Missile Range, for example, is performing his duties in an area of extreme electronic density. We have only to read our daily newspapers to learn of the many successful launches from the Pacific Missile Range and its neighboring facilities as an attestation of the effectiveness of his work. The success of the Pacific Missile Range Area Frequency Coordinator can be attributed not only to the personal skill of the Navy personnel involved, but also to the excellent teamwork displayed by the Army, Air Force and Marine Corps personnel engaged in communications-electronics operations in the area. At the same time, we must pay tribute to the representatives of the civil interests in the Southern California area with whom the most cordial and cooperative working relationships have evolved, particularly with the local FCC Engineers-in-Charge in the Southern California area.

As you have indicated in your "editor's note," control of radio frequency interference is recognized as a necessity. This is not only because of the debilitating effects of harmful interference but also the finite nature of the radio frequency spectrum which requires the most judicious use of frequencies in order to satisfy the steadily increasing requirements of our communications-electronics operations.

L. R. RAISH
Commander, U. S. Navy
Head, Radio Frequency Spectrum Branch
Office of Naval Communications

Women in AFCEA

Dear Sir:

The course of the average woman's life rarely puts her in the mainstream of military and industrial affairs. And yet, her future—and that of her family and loved ones—is intimately bound up in the status of our national military posture and the strength of our free economy.

Being associated with AFCEA, almost from its beginning, has enabled at least one woman to share some of the thoughts of our leading minds on military matters and to glimpse some of the products of our leading manufacturers of military equipment. She wishes that more women might be made aware of the Armed Forces Communications and Electronics Association.

Through an AFCEA meeting, she was introduced to the Space Age, four-and-one-half years before Sputnik.

Even through SIGNAL advertisements, a woman can learn that Bendix makes more than clothes-washers; GE, more than steam-irons; Westinghouse, more than refrigerators; and Bulova, more than watches—and that breakthroughs in defense research often wind up in better household items, too.

Though her total association with AFCEA, a woman can become a wiser voter on defense matters and military appropriations; a sager investor in corporate stocks and bonds; a better parent or counselor of youngsters; a more interesting conversationalist.

Her grasp of military matters will no longer be limited to the dapper appearance of a uniform or to just the arm or service of a relative. She will learn how communications and electronics are an integral part of the Army, and the Navy and of the Air Force—upon, and beneath, and above the earth's land and sea surfaces. She will learn that today's military training prepares a son, nephew. or brother not only for an active military career but also can lead to an allied civilian career in radio, telephony, photography, television, automatic data processing, meteorology, research and development, and other fields too numerous to mention.

At least one distaff member of AFCEA regrets that the list of new members in each month's issue of SIGNAL contains so few feminine names and most times none at all. She hopes the men will introduce their wives and women associates to some of the advantages of AFCEA outlined above. She is grateful to the male colleague who encouraged her to join AFCEA many years ago.

ANNE MELSON STOMMEL
Publications Engineering Dept.
U. S. Army Signal Materiel Support Agency
Fort Monmouth, N. J.

PROJECT HEAT

FOR MILITARY APPLICATIONS

In cooperation with research and engineering commands of the U.S. Armed Forces, Hunter Manufacturing Co. for more than twenty years has specialized in the design, development and manufacture of multi-fuel-burning heating systems.

Hunter heating systems with *sealed-in-steel* combustion are employed for a wide variety of military uses—for space and personnel heating in mobile shelters, in portable or fixed structures of many different types, in self-propelled vehicles, in ground support systems for missiles, in radar and microwave systems, etc.

Other types of Hunter systems are widely used in winterization operations, for engine pre-heating, for emergency heating requirements and for many other using arm operations. Hunter heating systems are designed for cold starts down to 65° below zero and are air-circulating in type with thermostatic controls. Uncontaminated heat capacities range from 15,000 to 300,000 BTU/hour.

If you have a problem involving the application of heat, Hunter can help you solve it.

Complete research and development facilities available. Contact:

SPECIALISTS IN HEAT FOR MILITARY APPLICATIONS

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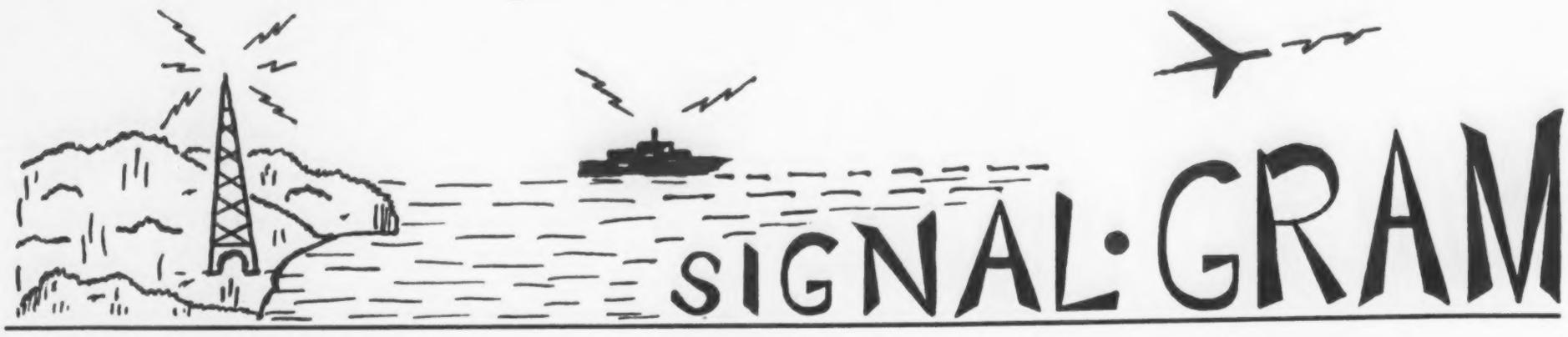

—GOVERNMENT—

FCC AND NASA have issued a joint statement on civil space communications setting forth certain conditions of fact and certain policy guidelines agreed upon by the two agencies. These are some of the conditions of fact contained in the "Memorandum of Understanding" which was signed by Frederick W. Ford, outgoing FCC Chairman, and Hugh L. Dryden, Deputy Director of NASA, Feb. 28: (1) Present state-of-the-art suggests feasibility of using satellites for world-wide communications services; (2) Further research and development is needed to prove the "technical and economic feasibility" of using these satellites on a commercial basis; (3) Congestion and technical limitations of certain portions of the radio spectrum and the "increases in capacity necessary to satisfy new services, such as transoceanic TV and wide-band data transmission," require the use of satellites for world-wide communications.

GUIDELINES FOR SPACE COMMUNICATIONS set forth by the Federal Communications Commission and the National Aeronautics and Space Administration include: (1) "The earliest practicable realization of a commercially operable communication satellite system is a national objective;" (2) "The statutory authority of NASA and the FCC appears adequate to enable each agency to proceed expeditiously with the research and development activities necessary to achieve a commercially operable communication satellite system;" (3) "Both NASA and the FCC will conduct their respective activities with a full exchange of information so as to accelerate necessary research and development and to coordinate Governmental actions necessary to attain the national objectives;" (4) NASA will continue to direct its activities "toward the advancement of space technology and its application to civil communications;" (5) FCC will continue to direct its activities "toward the development of communications policy and the implementation and utilization of space telecommunications technology through the licensing and regulation of United States common carriers." (6) The allocation and assignment of frequencies for the satellite system will be performed by "existing inter-agency organizations and procedures."

INTERNATIONAL SATELLITE COMMUNICATIONS SYSTEM that would be available to all nations for world-wide telephone, radio, television, telegraph and data services has been suggested by Radio Corporation of America in a proposal presented to the Federal Communications Commission. The proposal was contained in a response by RCA and RCA Communications, Inc. to an FCC inquiry relating to allocation of frequency bands for space communications. The single all-purpose satellite system would provide communications services through two or three satellite relay stations orbiting 22,300 miles above the equator. RCA told the FCC that such a system could be achieved during the 1960's in a form that would provide communication channels for all international services through their own ground stations, thus eliminating the need for many separate nationally owned systems. With the RCA proposal was a recommendation to the FCC that space in the radio frequency spectrum be made available for the satellite communications system, and that action be taken to encourage its establishment "on a basis that would provide equitable access to all communications carriers."

FCC RECEIVED EIA REAFFIRMED VIEW that world communications systems using space satellites can be operated without interfering with existing point-to-point radio services. Radio frequency reservations for surface communications, the Electronic Industries Association's Microwave Section declared, should be amended to permit channels to be shared by satellite systems which will make possible world communication services unattainable prior to the space age. EIA has recommended that: 1) All earth terminals for satellite communication systems be set apart by regulatory definition and that hearings prior to their licensing be made mandatory; 2) Engineering standards be established applicable to satellite and surface communication systems and that methods be developed for applying the standards in frequency-sharing determinations.

GE's RESPONSE TO FCC INQUIRY calls for a satellite telecommunication system consisting of 10 space vehicles orbiting in controlled, equally spaced intervals. Called a "common carrier's common carrier," General Electric's proposed system would be operated as an independent international communications system serving and linking already existing communications carriers throughout the world. Concerning the frequency allocations problem, GE believes that there should be an allocation of 10 mc in the 1000-2000 mc band for low density telecommunications circuits to be used exclusively for space purposes. However, GE suggests allocation of 500 mc in the 1000-10,000 mc band for use on a shared basis with ground services.

DEFENSE NATIONAL COMMUNICATIONS CONTROL CENTER was dedicated March 6. The Center is the initial step in the Defense Communications Agency's responsibility to monitor and control the world-wide long haul, non-tactical communications systems of the Army, Navy and Air Force.

FIRST BMEWS TELEPHONE CIRCUITS have been made available for U.S. Air Force use between the missile detection station at Clear, Alaska and Fairbanks, Western Electric Co. announced in February. This initial link from Clear is via a high quality radio system connecting the Air Force stations at Murphy Dome and Pedro Dome to the Alaskan Communications System office at Fairbanks. The Ballistic Missile Early Warning System at Clear will become operational sometime this summer.

RECENT DEVELOPMENTS IN POLARIS PROGRAM include: 1) The USS Patrick Henry set a record by cruising 66 days and 22 hours, totally submerged; 2) Funds for the construction of 5 additional Polaris submarines have been included in the Navy's fiscal 1962 budget estimates; 3) Hoffman Electronics Corp. has received funds for research, development and production of additional high powered transmitters (AN/WRT-4) for use by the FBM subs.

IONOSPHERE BEACON SATELLITE will be launched by a Juno II rocket under the direction of the National Aeronautics and Space Administration some time in the near future, according to NASA. The purpose for the scientific experiment is to get more information about the ionosphere, specifically to find out more about the shape of the ionosphere. Long-range communications, dependent upon reliably bouncing signals off ionosphere layers, require much more information about the ionosphere. The new payload being prepared for orbit has a 6-foot loop antenna around its equator to transmit its low frequency signals to ground stations. Several universities in the United States and New Zealand are participating in this experiment.

FEDERAL SUPPORT OF SCIENTIFIC R&D for fiscal year 1961 is estimated at $9.1 billion, the National Science Foundation announced. The estimate includes $8.5 billion for conduct of research and development, with about $850 million of that amount being marked for basic research. The 1961 total of $9.1 billion compares with obligations of $7.4 billion in fiscal year 1959 and an estimated $8.6 billion for fiscal year 1960, according to Federal Funds for Science, IX; The Federal Research and Development Budget, Fiscal Years 1959, 1960, and 1961, issued by NSF.

DEFENSE MILITARY DEPT. SECRETARIES have been directed by Secretary of Defense McNamara to give renewed personal attention and emphasis to defense procurement from small business sources. The secretaries have been asked to encourage prime contractors to make greater efforts toward eliminating sole source contracting and to increase the competitive opportunities for such work among small business. Responsibility for direction of this program has been assigned to Graeme Bannerman, Deputy Assistant Secretary of Defense (Installations and Logistics), who is responsible for procurement policy matters of the Defense Dept.

AIRWAYS AND AIR COMMUNICATIONS SERVICE has become the single manager for contracting and funding all Air Force leased commercial communications. The action occurred in February when AACS assumed management of the Strategic Air Command's Zone of Interior Communications Service Authorization. AACS assumed the responsibility for contracting and funding for the other Air Force facilities in 1960. AACS began contractor negotiations for Air Materiel Command, Tactical Air Command, USAF Security Service, Air University, Air Research and Development Command, Secretary of the Air Force, and the AF Technical Applications Center in July 1960. In October of that year Air Defense Command's leased commercial communications responsibilities were transferred to AACS along with ADC's 4607th Support Group.

NEW PENTAGON SCIENCE-CHIEF is Dr. Harold Brown, who succeeds Dr. Herbert F. York as the Defense Department's Director of Research and Engineering. Prior to his Defense appointment, Dr. Brown was Director of the Lawrence Radiation Laboratory of the University of California at Livermore. Dr. York has been named Chancellor of the University of California's new campus at San Diego. (*Continued on page* 28)

by DWIGHT D. GUILFOIL, JR.
President and Co-Founder, Paraplegics Manufacturing Company, Inc.

PARAPLEGICS MANUFACTURING COMPANY, INC.

PARAPLEGICS MANUFACTURING Company, Inc. is an electronics, electrical and mechanical products and services subcontractor. We perform over 170 different manufacturing operations, ranging from routine assembly and packaging to advanced electronic product development.

The corporation was formed in 1951 at Bensenville, Illinois when a fellow paraplegic with an electronics background and I started talking about our future. We decided that electronics was one field that depended upon brain and handpower, not on running footraces. With a little checking we found that there was a substantial pool of well trained, knowledgeable physically handicapped to draw upon. An initial check of possible clients looked promising. So we pooled our finances, rented a plant, and hired several dozen of the many capable workers available.

Despite the rosy predictions, the going was rough. We could get no bank loans.

Although many companies had indicated earlier that they would have subcontracts for us, they did not have these contracts. However, the Hawthorne works of the Western Electric Company finally broke the ice. On the strength of our successful performances for Western Electric we were able to get other important subcontracts.

There then followed a dry spell with the cessation of the Korean hostilities. During the period of readjustment many electrical, electronics, and mechanical production firms suffered cutbacks; Paraplegics Manufacturing Company was no exception.

New Plant Completed

It has been quite a leap from those dark days to our new plant recently completed in Bensenville. This plant incorporates the special conveniences that enable our physically handicapped workers to achieve maximum performance. It demonstrates how effectively the physically handicapped can compete in the rough-and-tumble electronics industry, when efforts are made to provide utilization of their real capabilities. Ramps have replaced stairs, and especially wide doorways allow easy passage of wheelchairs. Individually engineered tools, jigs and fixtures to accommodate each worker for the type of job to be performed are provided.

The year-in, year-out steady support of our customers has been of immeasureable assistance in our development. Western Electric has been a constant customer for ten years. The Los Alamos Scientific Laboratories of the University of California have been buying from us for eight years. The users of our services span the country and include such giants of the defense program as Ramo-Wooldridge, Denver; Hallicrafters, Chicago; Bendix Missile, Mishawaka, Ind. and Stewart-Warner, Chicago. For them we make electronic components and assemblies ranging from sub-miniature cable assemblies to missile timers. Complete component board assemblies for the "floating binary point" computer are now being constructed for Argonne National Laboratories. The University of Chicago has given us a production order for miniature scalers, amplifiers, and power supplies for use in a satellite to measure radiation.

During the Korean War we received approximately one-third of a million dollars in prime and subcontracts. For Collins Radio we

(*Continued on page* 44)

Dwight D. Guilfoil, Jr. (right), president of Paraplegics Manufacturing Company, Inc., is presented with testimonial scroll, signed by the company's nearly one hundred physically handicapped workers, on the tenth anniversary of the founding of the company. Forest M. Haley (center), plant superintendent, made the presentation on behalf of the employees. Quality control manager, Irvin M. Pryble is at left.

FAIRCHILD BASIC RESEARCH LABORATORY ADDS A NEW DIMENSION TO PHOTOGRAPHIC CHEMISTRY

New insight regarding the interaction of light with solid state photosensitive surfaces is now being gained at Fairchild's Basic Research Laboratory. Defense Products Division scientists are also discovering new facts about the role of free radicals and molecular complexes in the photographic development process. Such knowledge can produce photographic materials of unprecedented speed and resolution which are capable of virtually instantaneous processing. Another result can be very thin solar cells of wide area and sensitive to radiation from the ultraviolet to the infrared which can be of great value in space exploration. Vastly improved developers can also be foreseen in new data concerning photographic chemistry. This basic and applied research and development is contributing advanced products and techniques for military and industrial application, assuring Fairchild's continued leadership in the photographic field. The Basic Research Laboratory and its achievements are available for your programs. For a brochure and further information, write the Director of Marketing, Defense Products Division.

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CAMERA AND INSTRUMENT CORPORATION

DEFENSE PRODUCTS DIVISION
ROBBINS LANE, SYOSSET, L. I., N. Y.

Engineers and scientists are invited to discuss new opportunities presented by continuing growth of the Defense Products Division.

NATIONAL AMATEUR RADIO WEEK has been proposed in a resolution (H. J. Res. 188) introduced in the House of Representatives by Wm. F. Ryan (D., N.Y.). The resolution designates the third week in June of each year as the time for "appropriate exercises to further and stimulate interest in amateur radio in the United States."

CONTRACTS: ARMY: George A. Fuller Co. and the Del E. Well Construction Co., construction of operational Minuteman facilities at Malmstrom AFB, $61.7 million; Radio Corporation of America, Defense Electronic Products, production of 380 units of a tactical radio relay system (AN/GRC-50), $9.4 million; Minneapolis-Moline Co., production of lightweight frequency switch carrier telegraph systems (TCC-4), $2.4 million. NAVY: Babcock Electronics Corp., production of additional radio remote control systems for use in the Fleet Rehabilitation and Modernization program, $3 million; Melpar, Inc., production of two operational flight trainers which will simulate the full weapon capability of the A4D-2N weapon system, $1.7 million; Chicago Aerial Industries, Inc., production of aerial reconnaissance systems for use by supersonic Navy Crusader jets, $1.5 million. AIR FORCE: Radiation Inc., manufacture of Telegraph Distortion Measurement Systems to be used in locating troubles in USAF telegraph and data circuits without interrupting message traffic, $700,000; Hughes Aircraft Co., technical assistance in activating Titan ICBM base at Mountain Home, Idaho, amount undisclosed (subcontract from Martin Co.)

—INDUSTRY—

RADAR FOR OUTER SPACE developed by Hughes Aircraft Co. makes use of the laser, or optical maser, which the company designed in July 1960. The new radar, called Colidar (for Coherent Light Detection and Ranging) detects distant targets by using the "coherent light" beam, a narrow light beam, instead of microwave signals used by conventional radar. Colidar will provide "the first practical long-range radar for use in outer space," according to Hughes officials. They believe Colidar has the low weight, low power needs and small size to make it practical to launch in a satellite into outer space. Colidar's transmitter is a laser (for light Amplification by Stimulated Emission of Radiation) that generates a nearly parallel, monochromatic light beam, and its receiver is an optical system coupled to a photoelectric tube.

MANSON LABORATORIES, INC., Stamford, Conn., has been awarded a contract by Sperry Gyroscope Co. for the building of power supplies for Loran C long-range navigational equipment which will be used in U. S. Coast Guard installations throughout the world. The Manson equipment will supply power of 100 kw.

THERMOELECTRIC AIR CONDITIONED SUIT which can keep the wearer comfortable in outside temperatures ranging from 40 degrees below zero to 135 degrees Fahrenheit has been developed by scientists of the Westinghouse Electric Corp. and the U. S. Naval Supply Research and Development Facility. The suit is an experimental model for testing the possibility of air-conditioned attire for military personnel. Heating or cooling of the garment is done by thermoelectricity, a refrigeration technique that eliminates the need for conventional moving apparatus. Cooling is accomplished simply by passing an electric current through thermoelectric couples made of semiconductor materials. Reversing the current causes the materials to heat instead of cool. A temperature of about 80 degrees F is maintained inside the suit.

THREE-POUND TRANSMITTER is the nucleus of a new personal call system developed by Multitone Electronics, Limited, of Toronto, Ontario, Canada. Fully transistorized, the 15-channel unit provides either speech or private coded signal for 15 people carrying 5-ounce pocket receivers.

MITE CORP. was formed in February with the merger of Greist Manufacturing Co., and Teleprinter Corp. MITE (Miniature Industrial Technical Equipment) will have plants in New Haven, Conn. and Paramus, N. J. Specializing in metal stampings and machine assemblies, Greist has been active in recent years in the manufacture of cameras. Teleprinter is a research, design and development organization whose efforts are primarily in the field of low cost, miniaturized data input and output devices for military and commercial uses. The new corporation will integrate Greist's extensive manufacturing facilities with Teleprinter's engineering and development ability, according to H. S. Stone, Jr., MITE president.

SOLUTION TO RFI from high-power microwave transmitters has been developed by General Electric Company's Power Tube Dept. Scientists and engineers at the department's Traveling-Wave Tube Product Sec., Palo Alto, Calif., have perfected a technique for making waveguide power filters which are said to eliminate radio frequency interference caused by harmonics. The filters absorb the unwanted harmonic signals produced by all transmitting tubes, but still allow the intended fundamental frequency to pass through with its power undiminished.

CONTINENTAL CONSULTANTS, INC. is a new firm offering consultation services in the fields of labor, management, finance and engineering, public and government relations, proposal preparation, technical writing and contract administration. Located in Washington, D. C., the firm has been formed by John F. Gilbarte, former Vice President of Admiral Corp., Military Laboratories Div., and Michael J. Macdonald, former Director of Marketing for Craig Systems, Inc.

SIEGLER CORP. has received an initial contract of approximately $350,000 from Convair Astronautics Div. of General Dynamics Corp. to participate in the NASA Centaur space booster program. The contract to Siegler's Hallamore Electronics Div. calls for the design and manufacture of a television instrumentation system for the Centaur vehicle. Centaur is a two-stage rocket which will be capable of placing large payloads in a low satellite orbit and of sending instrumented probes deep in space. The Hallamore TV system will monitor the liquid hydrogen fuel tanks in the Centaur vehicle to determine the position and state of the fuel in orbital flight. Information transmitted by the airborne TV system will be picked up by selected ground monitoring stations located around the world, and will be recorded on standard magnetic tape.

—GENERAL—

RFI PROBLEMS will be discussed at the 1961 conference of the Seventh Region of the Institute of Radio Engineers, April 26-28, at the Hotel Westward Ho, Phoenix, Ariz. Subjects and speakers include: "Problems Associated with Crowding of Frequency Spectrum," by Dr. D. E. Noble, Motorola, Inc.; "Control of Interference Between Satellite Communication Terminals and Surface Services," by Dr. W. L. Firestone, Motorola, Inc.; "Control of Surface-Service Interference with Communication Satellites," by Dr. S. G. Lutz, Hughes Research Laboratories.

GUIDEBOOK TO TEACHING WITH ELECTRONIC DEVICES will be prepared by the Electronic Industries Association under contract to the U. S. Office of Education. A special Language Laboratory Guidebook Project Task Force of the EIA Educational Coordinating Committee, composed of manufacturers of electronic language teaching devices, will supervise and direct preparation of the booklet, entitled "A Technical Guide for the Purchase and Use of Language Facilities and Equipment."

DEFENSE OFFICIALS PRAISED YMCA on its Centennial of Service to the Armed Forces and requested the Armed Forces to cooperate in commemorating this anniversary. Secretary of Defense Robert S. McNamara and General Lyman L. Lemnitzer, Chairman of the Joint Chiefs of Staff, have sent statements to the Young Men's Christian Association and to each active post, camp base and station command in the United States and overseas. The YMCA's armed services work began in 1861, when the Association sent volunteers to battlefields and hospitals to provide spiritual and physical comfort to Union and Confederate soldiers. Currently, the YMCA directs recreational and welfare programs for United Nations troops in the Gaza Strip and the Congo, and provides social, educational and non-denominational religious service to military personnel in more than 1,000 local YMCA's.

AT JOINT URSI-IRE MEETING held at the Boulder Laboratories of the National Bureau of Standards last December the following points were discussed: a computational technique for evaluating atmospheric bending of radio waves; recordings at Palo Alto, Calif. of the instantaneous frequency of both WWV-20 and a highly stable HF transmission from Puerto Rico; means of detecting satellites by their influence on the ionosphere. Five hundred and fifty attended the meeting at the invitation of the International Scientific Radio Union and the Institute of Radio Engineers.

MODERNIZATION OF COMMUNIST CHINA'S RADIO MANUFACTURING INDUSTRY is progressing "with great vigor," according to a report released by the Office of Technical Services, Business and Defense Services Administration, U. S. Department of Commerce. Containing six articles on radio production in Communist China, the report is one of four translations of foreign technical literature on radio manufacturing and engineering recently released to science and industry by BDSA. Entitled "Radio Industry in Communist China," the report includes articles on mechanization and automation advances, standardization of radio receivers, automation of the Nanking electronic tube factory, mechanization and automation of the Hua-pei radio works, plus short general and pictorial items.

CALENDAR OF EVENTS:
APRIL 10-12: National Military-Industrial Conference, sponsored by the Institute for American Strategy, Hotel Sherman, Chicago, Ill.
APRIL 10-12: Symposium on Materials and Electron Device Processing, sponsored by the American Society for Testing Materials, Franklin Institute, Phila., Penn.
APRIL 26-28: Seventh Regional IRE Technical Conference and Electronic Exhibit, Westward Ho Hotel, Phoenix, Ariz.
MAY 8-10: National Aerospace Electronics Conference, Dayton, Ohio.

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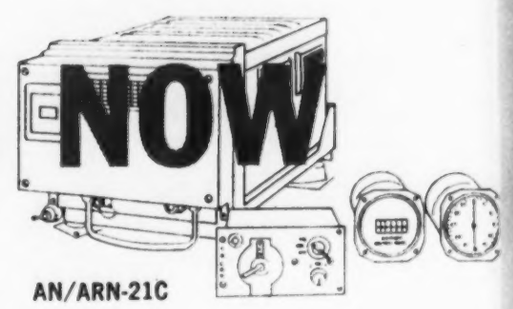

AN/ARN-21C

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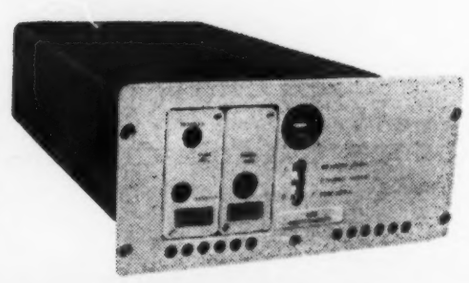
FOR

F-104



B-58

Hoffman test equipment checks TACAN accuracy — on the bench or in the cockpit

* Defense Department's Advisory Group on Reliability of Electronic Equipment

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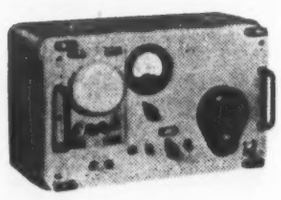

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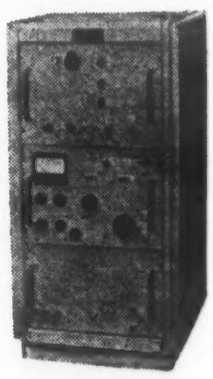
HLI-103 BEACON SIMULATOR duplicates all functions of the AN/URN-3 surface beacon. Tests for full azimuth and entire range, closure and departure speeds, surface beacon identity tone and decoding functions. For bench test or cockpit check.



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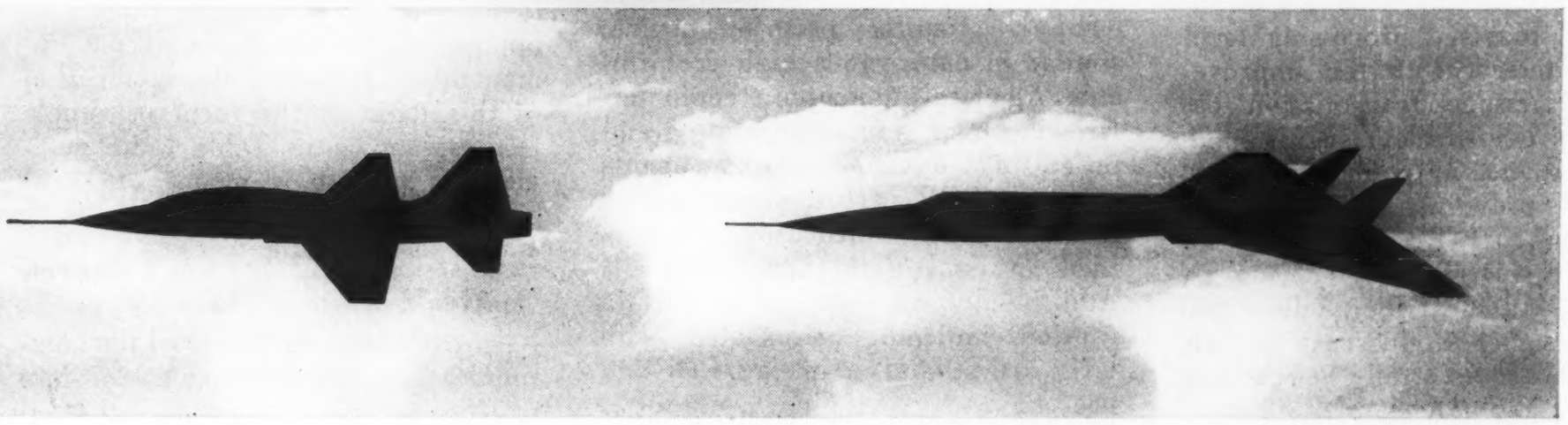
T-38  **XB-70 AIRCRAFT**



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MESSAGE PROCESSING

HOW THE USAF WILL DO IT ON THE COMLOGNET

by **DONALD J. O'ROURKE**

Communications Systems Project Office
Plans & Integration Office
Directorate of Data Systems
Hq Air Materiel Command
Wright-Patterson AFB, Ohio

THE GROWING EMPHASIS on faster transmission rates, along with the accompanying tendency toward automation of message switching functions, has resulted in the achievement of rapid message center-to-center movement of information. There is also an associated need to develop an improved message processing capability.

Message processing, in the broadest sense of the term, implies the ability to react to indicative information found within the message and achieve its delivery to a terminal point and/or the generation of a secondary action, triggered by the primary message.

Awareness of this need for development of message processing techniques collateral with the improvement of message transmission capabilities provided the basis for opening a new era in communications. The vehicle providing entrance to this era is the USAF COMbat LOGistics NETwork, "COMLOGNET."

The COMLOGNET, as described in the November 1960 issue of SIGNAL, is an automatic, fully electronic, transistorized, high speed data communication system. It will be the world's largest and most advanced digital data system providing more efficient control of Air Force weapon systems, materiel and personnel. Unique in its features is COMLOGNET'S ability to employ a high order of electronic logic for the difficult task of message processing without sacrificing any of the associated factors of speed or accuracy.

"Heart," or perhaps more correctly, "brain," of COMLOGNET is the Communications Data Processor, (CDP). The CDP, as the term implies, performs the message processing function of COMLOGNET. Functioning within a store and forward concept of operation, the Communications Data Processor provides message process control, high speed magnetic core storage and electronic logic for automatic application of routing and precedence doctrines.

Tasks of CDP

The Communications Data Processor is a stored program device, similar in nature to a high performance general purpose computer. Drawing upon a message routing and processing doctrine stored in its memory, CDP performs the routine task of routing information to a specified terminal of the COMLOGNET. Additionally, in response to certain routine indicators associated with large operational complexes, CDP will process and release segments of a message to local or remote tributaries. Messages to be processed in this way will be composed of 80 character length segments or records.

As the message is processed through the COMLOGNET Switching Center, the CDP functions to recognize the type and priority of information contained within the text. The message in turn is disassembled i.e., separation of header and unrelated segments—and then coherent segments are re-assembled with new addresses assigned to allow delivery to the appropriate materiel manager. Separation and reassembly of this logistic message is performed on the basis of predetermined criteria which anticipated the nature of information to be transmitted and the reaction required by the switching center to assure effective action.

Ultimate delivery of processed messages and their associated segments is predicated upon the application of computer logic to the communication problem. This computer logic is of an elementary nature as opposed to the functions of the human mind. However, the application of this logic in the form of simple tests as shown in Table I are sufficient to provide a means of rapid and efficient processing of most USAF data communications.

Realization of Advantages

In realizing a marriage of the communications art to the science of data processing, the USAF has achieved a significant advancement in the state-of-the-art of information processing. Some of the advantages of this marriage are only now becoming apparent and it is anticipated that subsequent advantages will be realized as more and more awareness of this new system is realized.

TABLE I: COMLOGNET LOGIC TESTS

1.	**Alphabetic:**	Is X contained within the set a, $a = (A, B, \ldots Z)$
2.	**Numeric:**	$X = X_1 X_2 - X_8$ where $xi = (0, 1, \ldots 9)$ 10
3.	**Equality:**	$X = K$
4.	**Magnitude:**	$K_1 < X < K_2$; $X > K_1$; $X < K_2$

FILMWORK AND NATO MISSILES

by A. J. ROBBINS

Systems Supervisor
Microfilm Products
Minnesota Mining and Manufacturing Company

Lucien J. Hall, (left) section head, documentation and services, NATO Support Department, Raytheon, holds deck of "Filmsort" aperture cards and Joseph Bastek (right) has original paperwork.

A MILLION PIECES OF ENGINEERING and manufacturing paperwork have been converted into filmwork to build missiles for NATO.

The daily conversion of paperwork into data processing and microfilm takes place at the NATO Support Department of Raytheon Company, Andover, Massachusetts. There, engineering drawings, specifications, tool drawings, work process sheets, quality inspection and test procedures are microfilmed and put into "Filmsort" aperture cards. The finished cards then are flown to NATO which parcels out the engineering and manufacturing know-how to five European countries to build missiles for the NATO Forces.

The entire cycle, from the release of the engineering package to NATO Support Department, Raytheon, Andover, to delivery of aperture cards to Europe, is compressed within five to seven working days by Lucien J. Hall, section head of documentation and services. The procedure keeps the European missile manufacturing points current with United States design and major production changes.

Raytheon, Andover, in addition to assembling the information into Filmsort aperture cards, also sorts out the engineering packages in the distribution order required by NATO, Europe. This distribution sequence simplifies the collating and shipment of data from the central receiving point in Europe to the five manufacturing centers.

Operation of System

According to Hall, the Raytheon transmission of engineering and manufacturing data in aperture cards is believed to be, in some ways, a first. In this instance, both engineering and manufacturing know-how are being sent to NATO. Therefore, European points have the same assembly line and production sequence of operations as their American counterparts. A missile system is in a fluid state of design and, consequently, there are constant changes.

In a consumer product, and even some industrial products, the new product line usually is not assigned to an international plant until major design is frozen, Hall stated. In this case, however, design and major production changes are distributed daily, within days of change authorization, to points thousands of miles from the design and manufacturing control points.

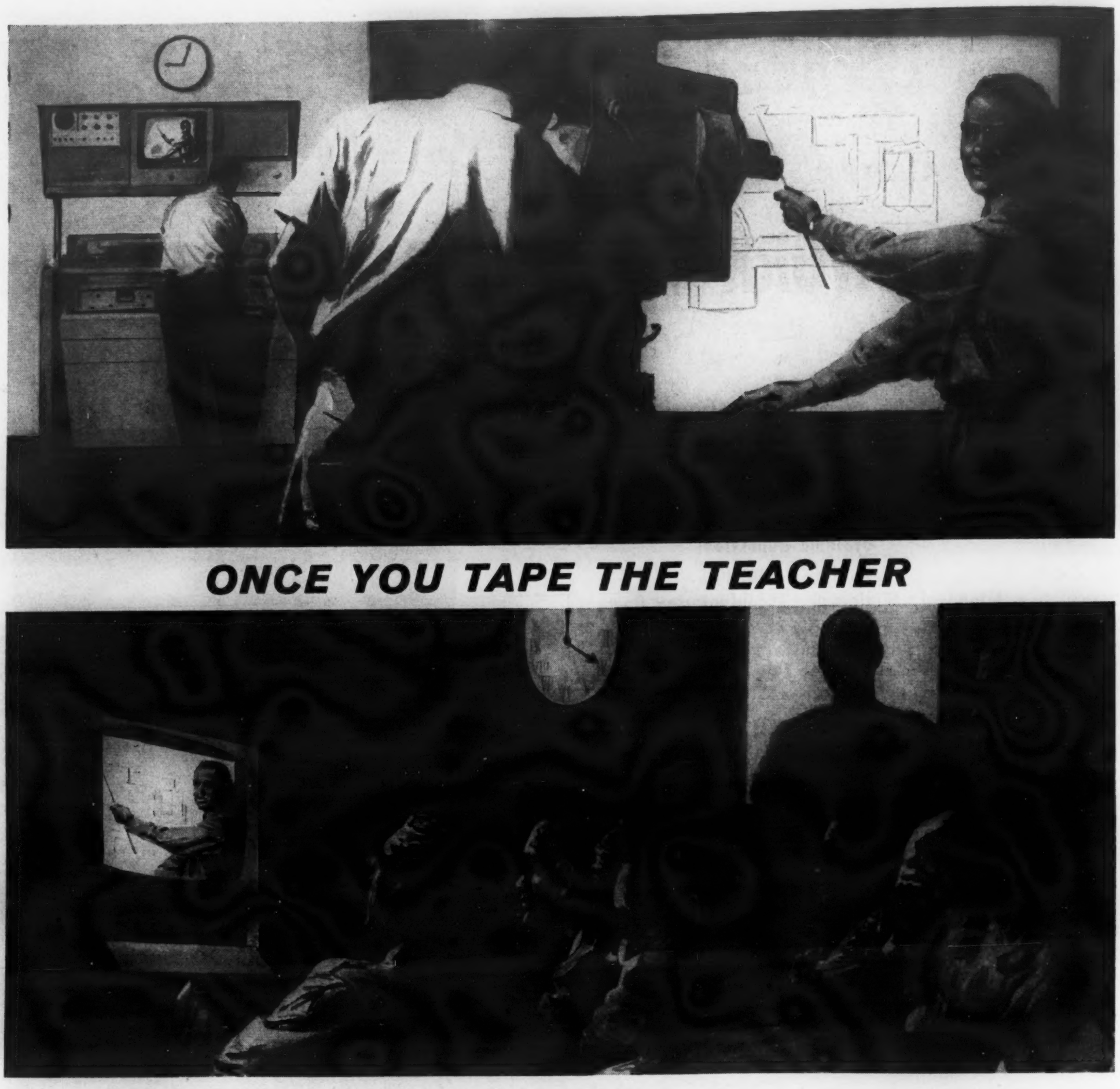
A special Raytheon data section receives the daily engineering packages and major production changes and microfilms the package.

After the processed film is returned, source sheets are made up for IBM key punch operators from roll film readers. From these source sheets, two master sets of data processing cards and two aperture cards for each document are prepared.

The film then is mounted into the aperture cards which, in turn, are fine-sorted into the distribution sequence required by NATO for their issue print distribution. Next, cards are flown to NATO, which makes up the print distribution and retains the master aperture card set to replace vellums at the five European manufacturing points.

One set of master data cards and one set of aperture cards are maintained by Hall. He uses them, with a Thermo-Fax "Filmac 200" Reader-Printer, to provide reference to the engineering and manufacturing drawings in Filmsort aperture cards.

(*Continued on page* 36)



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ham operations in Antarctica

by
LT. (jg) ARTHUR D. CLIFF, USNR
Assistant Public Information Officer
Staff
Commander Naval Support Force
Antarctica

Operating ham radio gear at the NAF McMurdo ham shack.

NAF MCMURDO, ANTARCTICA—It is twenty degrees below zero at the bottom of the world. The sun shines brightly twenty-four hours a day as it is the Antarctic summer. The tops of a few buildings, oil drums, stacked equipment, and antennas, all in a half buried lonely cluster, make a tiny break in the sweeping snow plain of the South Polar Plateau.

Down inside the buildings the score of Navy men and scientists who man the South Pole Station of the Navy's Operation Deep Freeze 1961 have finished work for the day and in the evening hours of leisure their Ham operator has begun the job of bringing in evening radio contacts with the United States. Another Navy Ham in Davisville, Rhode Island is contacted. The Davisville Ham dials the number of a South Pole Seabee's wife, and the husband and wife, thousands of miles apart speak to each other.

At all U.S. Antarctic Stations, McMurdo, Byrd, the South Pole, and Hallett, there are Ham operators and equipment. These Hams, through their contacts with operators in the "States" provide a tremendous morale boost for Americans engaged in the imporant, taxing program of research on the isolated Antarctic continent.

Personal radio contacts between Antarctica and the United States began on a noteworthy scale in 1928 with the late Rear Admiral Richard E. Byrd's expedition to Little America. Every Saturday afternoon a radio speaker was placed in the center of the dining spaces and the men gathered to listen to "personal" voice transmitted messages read from station WGY in Schenectady, New York.

Occasionally families travelled to the station to speak in person to one of the men at Little America. In those days, however, the Antarctic replies were limited to dot-dash code.

Today, with improved equipment, the Hams of Antarctica continue their morale boosting on a far grander level. KC4USV at McMurdo operates a KWE1 single sideband transmitter, a 75A4 receiver, and a 35 foot TA33 triband antenna. With this equipment transmitting and receiving on the 20 meter amateur band with 1,000 watts power, the McMurdo Hams have contacts the world over.

Ham operator Marrion C. Smith of Dallas, Texas says, "You name the country, and we've spoken to someone there." "Smitty," a first class Navy radioman serving his fourth season of Antarctic duty, continued, "We've had contacts in Singapore, Nepal, Borneo, 9M2DB in Malaya—a month ago we spoke to Boris in Moscow."

"We picked up the national election results this November from Alaska and passed them on to another Ham in Nepal. McMurdo's even talked to the Potentate of Oman," the bearded operator continued, "but the real reason for hamming down here is morale."

Smitty turned to his equipment and began tuning in the first scheduled contact of the day. In the front room of the McMurdo Ham shack a group of the heavy-clothed men who man the McMurdo base, seabees, scientists, and ski-plane aviators to name but a few, had begun to collect. They sat in the quonset hut, its walls decorated with the cards of over a thousand ham operators, exchanging small talk as they waited to talk to their homes in the U. S.

"I've got W6QPI," Smitty said. He talked for a moment and then listened to the reply of a female voice bouncing southward off the ionosphere to Antarctica from California. "I think we're in good enough to try a few phone patches," he said and she agreed; Smitty motioned the first man into the Ham shack's sound proofed speaking booth. The California Ham took his name and address and began the job of placing his call.

"That's Betty in San Diego," Ed Ray, another of the McMurdo Hams, explained. "She has 4,000 hours in B-29s.

As the California phone patches continued, a group of Hawaiians, part of a team installing new communications for the Navy in Antarctica, walked into the shack. "We've got a schedule with KH6DZS, Eddie in Honolulu, this evening," the operator said. "These boys are doing a terrific job down here but some of them are away from

home for the first time in their lives and are pretty homesick—they really look forward to these calls."

Thus, as the three wall clocks showing local, east coast, and west coast time ticked, the evening of McMurdo Hamming continued. Eddie in Honolulu; Lloyd each Sunday evening in Oakland; Wes, an engineer who travels, in Toledo, are but a few of the Hams who keep morale boosting schedules with the U.S. Antarctic stations.

Often little more is known about another Ham than his or her first name and call sign. The McMurdo Hams speak of Doc, the dentist in Chappaqua, New York, who "does actresses' and baseball players' teeth." Then, there is Jules in New Jersey, and Paul at K9UNG in Plattsville. Who the Ham is does not matter—that he helps keep the men of Operation Deep Freeze a little closer to their homes is what is important. The fraternity of Hams the world over prefers making its contacts and extending its often wide and generous services without thought or desire for personal recognition.

Any isolated Deep Freeze man will testify to the generosity of the Hams who often stay awake throughout the night because of the differences in times. Last winter a Soviet glaciologist, working as an exchange scientist at McMurdo saw his infant daughter for the first time through the services of an American Ham's facsimile transmission.

Cy, a retired Michigan jeweler in his 70's checks in every night along with K5JLQ in Houston, Texas. These two Hams are among the Byrd, South Pole, McMurdo, and Hallett contacts who send "Hamgrams," another Ham service for Deep Freeze. In hamgramming, the Ham takes a brief message from the sender, radios it to the Ham nearest the home of the receiver, who in turn types the message and mails it to the intended reader free of charge.

During the weeks before Christmas, Commander Robert K. Thurman, Chief Warrant Officer Victor Young, Arthur G. Dufour, and Nello A. Bambini, were other licensed McMurdo Hams busy with the job of handling stateside flower orders. The orders, placed by Antarctic men, are radioed to the Clark, New Jersey Ham, who has them telegraphed to their destinations around the nation. The Clark Ham pays for the flowers and is repaid by money orders through the Antarctic mails.

When the Antarctic summer comes to a close, the aircraft and ships of the Deep Freeze summer season return northward. It is during the Antarctic winter months of fierce cold and darkness that American Hams are able to extend their greatest service to the men of Deep Freeze providing the one means of communication that keeps them free from total isolation.

Filmwork and NATO Missiles

(*Continued from page* 33)

Raytheon's NATO Support Department proposed and NATO accepted data processing and aperture cards to transmit engineering and manufacturing data from Andover to Europe. Major factors in this decision were the routines to speed handling procedures at shipping and receiving points.

Problems Simplified

In this country, Raytheon converted the paperwork into machinable filmwork. As a result, identical shipping and receiving records were made available for both Raytheon and NATO. These identical documents for transmission and receipt simplified communications problems in long-distance letter writing.

Transportation charges were a second factor in substituting aperture cards for full-sized reproducibles. A third factor was speed of air shipment for the more compact aperture cards.

Under the procedures established jointly by Raytheon and NATO, all the inputs of the engineering and manufacturing data systems take place at Raytheon. All the outputs take place in Europe.

Microfilming, data processing, film mounting and preparation of transmittal documents take place at Andover. Distribution, use and reproduction of the aperture cards take place in Europe. At the same time, NATO, Europe, has a duplicate set of data processing and aperture cards to match up its filmwork records in Europe with those at Raytheon, Andover.

The implications of transmitting engineering and manufacturing know-how from a U.S. plant to international plants are being studied closely in Hall's section.

One long-range possibility is that a company can build identical plants in many parts of the world. Engineering and manufacturing data can originate from one technical center for all plants. Standard procedures and standard industrial engineering practices could compare outputs and performance in all locations.

Moreover, microfilm data in the future could be transmitted back and forth from the tech center to the operating plants. The tech center could distribute design and manufacturing instruction. The operating plants could send back microfilm of localized improvements and local operating results.

Rewriting A Best Seller

This is the third in a series of articles which SIGNAL *is publishing on defense supply management. The material is being made available by the Office of the Assistant Secretary of the Army (Logistics).*

A POCKET size, 26-page Defense Department booklet has proved a continuous best seller since first printed in 1954. The booklet, with total sales in the hundreds of thousands, costs 15¢ from the Government Printing Office and offers a business proposition with dividends for all—the buyer, the seller and the American taxpayer.

Now in rewrite, this best seller explains how to buy military surplus property, and the American public will soon find it much easier to be a partner in this important aspect of defense supply management business.

Each year surplus used military property costing over $6 billion when new is sold to the public. More than 125,000 sales contracts are written each year covering 550,000 separate parcels of surplus property from typewriters to submarines. The biggest housecleaning job in military history has been underway since 1957.

Gains from Purchases

War-torn submarines offer little possibility for private use, but old LSTs (Landing Ship, Tank) make fine ferries or cargo boats for island trading. LSTs sell for an average surplus price of $61,000, somewhat high for the individual buyer, but used typewriters, depending upon condition, sell from $10. One enterprising citizen bought obsolete, dugout gas protective curtains made with felt on one side and rubber on the other, labeled them "pet mats" and found a profitable market with animal owners. Citizens with bank accounts large or small can gain from the disposal of property no longer capable of contributing to the national defense.

Defense sells military property because it is worn out, damaged, or because military science has technically outgrown the equipment of past years. The bomber of World War II is now fighting forest fires in the west; the wide variety of cold weather boots used in Korea eight years ago has been overtaken and eliminated by two highly improved types.

Rules of the Program

It is true that the greater part of military surplus, over $4 billion each year at book value, has no real commercial value except as scrap. More than a million tons of scrap from overage ships, planes and ammunition are sold each year and used in production of new goods for both the military and civilian economy. Yet even highly specialized military equipment can sometimes find a useful civilian purpose. Tanks, guns removed, are used for wrecking buildings. Old 60-inch revolving searchlights are busy at night keeping wild geese from the grain fields in the west.

The average citizen, however, wants to buy surplus from the thousands of items which have commercial counterparts and have some useful life expectancy. The new program will assure Mr. Taxpayer of a better opportunity to acquire such property.

Rules of the new program will be simple and direct. The first step for any interested citizen will be to file a short form application.

Soon to be available at major military installations throughout the country, the application form will provide space for the prospective buyer's name, address, type of property he is interested in, and the parts of the country where he will want to attend surplus sales or inspect property proposed for sale. The variable condition of military surplus property makes it desirable to physically inspect items before making a bid.

Once it is filled out, the citizen will mail his application to one central agency with the improbable name of "Armed Forces Surplus Property Bidders Registration and Sales Information Office." Procedures are more streamlined than the agency name, however, and Mr. Citizen will automatically receive sales catalogs and information on all property he has indicated an interest in, as it becomes available for sale.

Sales catalogs include information about how and when to bid. There are several methods to sell surplus property. One method is the "sealed bid" where the individual decides how much an item is worth to him, fills out a form included in the catalog, and mails it to a designated office where it is opened on a specified day and compared with other bids. Another method is the familiar auction sale where the bidder goes in person and bids competitively on property. Defense has successfully tested the use of closed circuit television over a six-city network for auction sales, and greater use will be made of this technique.

Consolidation of Sales Offices

To make it still easier to do business, Defense is closing the over 300 overlapping and competing military sales offices and is establishing 35 consolidated sales offices located within easy reach of any part of the country. These offices will schedule sales to eliminate duplicate offerings in the same area and will provide the single point of contact for administration of surplus sales.

The small buyer, interested in only one item, will be given opportunities to bid through procedures which will provide for sales offerings of one of a kind. More than 95% of military surplus sales are to individuals or small business concerns, which is indicative of the widespread public interest.

With a single information office and the consolidation of sales offices, Defense can make the most use of experienced people, reduce expenses and offer more attractively displayed property to a wider buying audience than ever before. The buyer will benefit from the simplicity of procedures, Defense will benefit from faster disposal, and the taxpayer will benefit from greater returns to the U. S. Treasury and reduced cost of defense supply management.

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GENERAL ELECTRIC

A TRIBUTE TO THE MARCH SPECIAL AIR FORCE ISSUE

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
Washington 25, D. C.

8 March 1961

Mr. Benjamin H. Oliver, Jr.
President, Armed Forces Communications
and Electronics Association
1624 Eye Street, N. W.
Washington, D. C.

Dear Mr. Oliver:

On behalf of the United States Air Force, I wish to express our deepest appreciation to the Armed Forces Communications and Electronics Association, and to the Editors and Staff of SIGNAL Magazine, for the outstanding presentation of the Air Force communications-electronics story in the March issue of SIGNAL.

This "Special Air Force Issue" is not only outstanding, but is gratifying as well. It is gratifying because it is another significant manifestation of AFCEA's continuing efforts ". . . to maintain and improve the cooperation between the Armed Forces and Industry in communications." Certainly, there can be no better demonstration of this stated purpose of AFCEA than your helping us to carry out one of the Air Force's major responsibilities: to report to the American public the complete record of our stewardship of resources—both human and material—in the national interest.

Looking to the future, I am sure that when the Air Force Communications Service is activated on 1 July of this year, the Air Force will count increasingly on AFCEA to help tell the continuing story of this, the newest Air Force major command. And I am confident that, for its part, the Air Force Communications Service will be able to provide even greater and more unified support to the admirable objectives of the Armed Forces Communications and Electronics Association.

Please accept this heartfelt "thank you" for AFCEA's magnificent contribution to a better understanding of today's Air Force Communications-Electronics.

Sincerely,

HAROLD W. GRANT
Major General, USAF
Director of Telecommunications

A copy of the Special March Air Force Issue of SIGNAL is presented to Major General Harold W. Grant, left, USAF's Director of Telecommunications, by Benjamin H. Oliver, Jr., AFCEA President.

The pilot is inside, flying over enemy lines.

The SD-1 Surveillance Drone flies remotely controlled tactical surveillance missions without risking manned aircraft or pilot. It is extremely mobile, simple to use and maintain, and can be readily adapted to carry TV or film cameras, infrared, radiation detection or radar reconnaissance equipment. The SD-1 is the Army's only operational surveillance drone. Northrop's Radioplane Division developed and produces it.

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- 150 Exhibitors
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- 4 Panel Discussions
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15th AFCEA Convention • June 6, 7 and 8, 1961

Tuesday—Wednesday—Thursday • Washington, D. C.
Sheraton-Park and Shoreham Hotels

Registration Only $1.00

THEME—*New Horizons With Time and Distance in Full Retreat*

PANEL DISCUSSIONS—*Timely subjects accenting the Convention theme.*

June 6, Tuesday, 10:00 a.m.: *by International Telephone and Telegraph Corporation*
"Present Media and Future Concepts of World Wide Communications"
Moderator: Dr. H. Busignies, Vice President for Research, ITT Corp. Introduced by RAdm. F. R. Furth, Vice President, ITT Corp.

June 7, Wednesday, 9:30 a.m.: *by General Telephone and Electronics Corporation*
"New Frontiers in Reliable Communications"
Moderator: Dr. Herbert Trotter, Jr., President, General Telephone and Electronics Laboratories, Inc. Introduced by RAdm. F. J. Bell, Vice President, GT&E Corp.

June 7, Wednesday, 2:00 p.m.: *"Scientific Applications of Electronics in Photography"*
Moderator: RAdm. Robert S. Quackenbush, USN (Ret.) Engineering Division, Polaroid Corporation. Introduced by K. B. Lewis, Eastman Kodak, Manager, Washington Office.

June 8, Thursday, 9:30 a.m.: *by Federal Bar Association*
"Recent Developments in Government Contracts and Procurement Procedures"
Moderator: E. K. Gubin, Private Practice and FBA Committee on Government Contracts and Procurement. Introduced by Frank Wozencraft, Attorney at Law.

KEYNOTE LUNCHEON—*June 6, 12:30 p.m., Speaker—Hon. Richard S. Morse, Assistant Secretary of the Army (Research and Development).*

RECEPTION—*June 6, 6:30 p.m.,* **BUFFET AND FLOOR SHOW**—*7:30.*

RECEPTION—*June 7, 6:30 p.m.,* **BANQUET,*** *7:30, Speaker—Frederick R. Kappel, President, American Telephone and Telegraph Company.*

INDUSTRIAL LUNCHEON—*June 8, 12:30 p.m., Speaker to be announced.*

MILITARY EXHIBITS—*Daily by the Army, Navy, Air Force and Marine Corps.*

INDUSTRIAL EXHIBITS—*Daily by industry showing the latest developments in communications, electronics and photography.*

EXHIBIT HOURS—*Tuesday, Wednesday, 11:30 a.m.-7:25 p.m.; Thursday, 11:30 a.m.-4:30 p.m.; at Sheraton-Park and Shoreham Hotels with continuous free transportation provided.*

HAM RADIO BOOTH—*Navy's Amateur Radio Station K4NAA will operate in Sheraton-Park lobby daily through the Convention.*

OFFICIAL OPENING CEREMONY—*June 6, 9:30 a.m., Sheraton-Park Hotel.*

LADIES PROGRAM—*Mrs. Dorothea Ostenberg, Chairman—Morning coffee served daily in the Madison Room, Sheraton-Park. Buffet dinner and floor show, June 6; Banquet, June 7. (Prices will be included in registration mailing.) For those ladies who wish to shop, ample time will be available.*

**Friends and guests are requested to be seated promptly at 7:30 p.m. This will allow for the introduction of head-table guests, presentation of the National Colors, the National Anthem, and the Invocation. In addition, tickets for the buffet, luncheons and banquet must be presented at the time of serving. Be sure to have your tickets with you.*

Paraplegics Manufacturing Co.

(*Continued from page* 26)

made units ranging from a C-628 control console to rf cabling. About ten thousand sets of the ARC/27 communications equipment were built for Admiral and Western Electric.

Some other defense projects we have handled include:

Cable, test plug, and torpedo lead assemblies for Naval Ordnance, Forest Park, Illinois, and Macon, Georgia.

Power supplies and panel assemblies for Oak Ridge National Laboratories, Oak Ridge, Tennessee.

Atomic reactor accelerator cable assemblies for the Midwestern University Research Association, Madison, Wisconsin.

Missile timers and check-out equipment, test equipment and panels, radar jamming timers, and controls for B-58 on an order from Wheaton Engineering, Wheaton, Illinois.

Cable assemblies, machined parts and components for the Electronic Supply Office at Great Lakes.

Cable assemblies for the U. S. Signal Corps, Philadelphia, Pa. and the U. S. Ordnance District, Chicago, Illinois.

Complete missile shelter control cables and panels for Jupiter C missile, for Barnes & Reinecke.

All in all, our military-related contracts have totalled slightly less than one and a half million dollars. That is considerably less than we would like or are capable of handling. In many instances, portions of even that amount have come only when the contractor was in a rough spot and could get nobody else to produce in as short a time as we could promise and then live up to our promise.

Because of the wide diversity of our employees' talents and training, Paraplegics Manufacturing Co., Inc., is unusually well qualified to play the anchor man role in the fabrication of components and complete, tested assemblies.

Recent evidence of this was the letter of commendation received by one of our customers, the Avnet Electronics Corporation, from the Navy. The new *USS George Washington* required special electronic items on an unusually short lead time. Avnet's . . . "positive reaction" and its "meeting the delivery deadline" earned the "sincere appreciation and gratitude" of Captain R. H. Northwood, USN, Commanding Officer. PAMCO was an integral part of this effort, I'm proud to say.

After selling our services for these ten years, there appears to me to be two basic reasons why customers use our services: First, a customer may be confronted with operations requiring equipment and facilities or manufacturing experience that they do not have. Here, Paraplegics offers the twin advantages of saving capital investment and the ability to make first-piece charges as low as standard piece cost. We eliminate costly initial worker training or equipment break-in period.

Secondly, Paraplegics has versatility of personnel and equipment, being able to produce maximum performance on long and short runs for over 170 manufacturing operations. Often PAMCO can guarantee prices that are lower than the customer's own prime labor charges plus normal factory burden.

We have some advantages that assure very high standards of workmanship, even under emergency pressure. Realizing that opportunities for advancement and full utilization of their maximum skills are relatively scarce elsewhere, our employees usually think of PAMCO as their lifework. They take great pride in the firm (abetted, of course, by the fact that almost everyone is a stockholder).

We suffer but very slightly from the "job hopping" that plagues the rest of the electronics industry. Thus, we have relatively little worker turnover. Ninety percent of our employees have been with us from one to eight years.

In a few instances, we have been surprised to learn that so-called handicaps can actually be assets. For instance, when working with photosensitive materials a sightless person may be able to work better in the absence of light than a man with twenty-twenty vision. The freedom from noise distractions can often mean greater concentration powers on the job for a deaf person. Adaptation needed here can be most simple.

We have found that designing a special facility to compensate for a particular disability (e.g., a foot-operated clamp for a man with an amputated arm often leads to innovations that would increase the productivity of *any* worker.

In many respects Paraplegics Manufacturing Co., Inc., is serving as a prototype for the organization of similar businesses throughout the world. Visitors from Europe and Asia are frequent. Recently a representative of the Sao Paulo, Brazil Department of Rehabilitation seemed especially taken aback by the quantity, quality, and variety of the machining, soldering, and wiring operations he saw performed at PAMCO. He observed over one hundred thoroughly trained and capable workers at ease using jewelers' tools and magnifying glasses on subminiature assemblies and/or assembling electronic printing press controls weighing over 500 pounds.

Unfortunately, we are still handicapped more by a slight public misconception than by any physical limitations. Many possible customers think of us as a charity-seeking enterprise or as a sheltered workshop. Each employee at PAMCO is selected because of the skill and the knowledge he has, not because of a handicap. Each is subjected to the same type of screening and aptitude testing that applicants undergo in other modern plants.

Five-Point Program

For some reason or other, there still remain . . . in these enlightened days . . . those who mistake a physical drawback in one's hands for a larger one in a person's head or heart. Such, of course, is not the case. And when we have had a chance, we have been able to prove it. All we have ever asked was a chance to place a firm, competitive bid alongside others in the field.

To clarify this point I want to submit my five-point program which Paraplegics follows.

1. Stop thinking of physically impaired people as "handicapped." This name is wrong. It was adopted to soften the word, "cripple," but the connotations of "handicapped" are even more painful to us. The name implies across-the-board inability to perform work functions, and this isn't true.

2. Let the handicapped compete. Many people, in a sincere effort to help disabled people, actually make things more difficult for them.

3. Don't dismiss the idea of employing handicapped workers without finding out what they can do—*on a fair and equitable basis.* We have a sign in our plant that says: "It's ability, not disability, that counts."

4. Recognize the physically handicapped as *individuals*—and deal with them that way. Sometimes their physical problems limit the scope of their activities, but they should be considered and recognized for their *individual* skills.

5. Don't patronize people with physical disabilities. The handicapped do *not* want to be coddled or fussed over. More than anything else, we want to be self-reliant.

AFCEA Sustaining and Group Members

Communications—Electronics—Photography

Listed below are the firms who are sustaining and group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

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HAWAII: Pres.—Col. W. A. Simpson, USA, Signal Office, Hq. USARPAC, APO 958, San Francisco, Calif. Sec.—Lt. Col. G. A. Kurkjian, USA (same address).

KOREAN: Acting Sec.—Col. J. E. Gonseth, Jr., J6 Div., UN Command, APO 301, San Francisco, Calif.

MARIANAS: Pres.—Cmdr. C. J. Alley, USN, U. S. Naval Comm. Sta., Navy 926, FPO, San Francisco, Calif. Sec.—Lt. Cmdr. W. Scott, USN, P. O. Box, FPO, San Francisco, Calif.

OKINAWA: Pres.—Lt. Col. Russell Marks, 313th Air Division, APO 239, San Francisco, Calif. Sec.—Thomas G. Byrd, Jr., Hqs. U.S. Army Signal Group, RYIS APO 331, San Francisco.

PHILIPPINE: Pres.—Lt. Col. M. A. Vargas, USAF, Hq. 13th Air Force, APO 74, San Francisco, Calif. Sec.—CWO-2 Robert L. Cloud, 1961st AACS Gp., Box 496, APO 74, San Francisco.

TOKYO: Pres.—H. F. Van Zandt, Standard Electric Corp., Box 49, Shiba P.O., Tokyo, Japan. Sec.—P. W. Becker, Hq. U. S. Army Sig. Comm. Agency, APO 343, San Francisco, Calif.

CHAPTERS AT LARGE

ALASKA: Pres.—Col. H. L. Hughes, USAF, Hq. Alaskan Air Command. Sec.—R. E. Witsiepe, Philco TechRep Div., Hqs., AAC, Box 6335, APO 942, Seattle, Wash.

SAN JUAN: Pres.—Clyde Dickey, Porto Rico Telephone Co., P. O. Box 4275, San Juan, P. R. Sec.—Albert R. Crumley, Jr., Crumley Radio Corp., Box 10073, Caparra Heights, San Juan.

Chapter News

REGION A

Fort Monmouth

Major General John B. Medaris, USA (Ret.), who formerly commanded the Ordnance Missile Command at Redstone Arsenal and was first commander of the Army Ballistic Missile Agency, was guest speaker at the February 23 dinner meeting held at Gibbs Hall Officers Club.

General Medaris, now president of the Lionel Corporation, spoke before a capacity audience of military and civilian members on the subject "Management of Modern Research and Development." The meeting was conducted by chapter president Dr. Hans K. Ziegler.

Lexington-Concord

Congressman F. Bradford Morse, (R) 5th Congressional District, Mass. addressed the luncheon meeting held January 27 on "National Survival." The meeting was attended by 161 members and guests.

Among items of business was the chapter's plans for providing scholarships to outstanding students in the Lexington-Concord area and for providing educational services in the field of science to local high schools; announcement of nomination committee for election of officers; presentation of group member certificate to Vance Holdam, Jr., vice president, Marketing, Laboratory for Electronics, the first company to receive a group membership through the chapter.

Congressman Morse said in his speech that in our troubled world today survival is dependent on our military strength, our diplomatic strength and our economic strength. He said that our gross national character is as vital as our gross national product to survival and progress.

On February 17 a social dinner-dance was held at Robinhood's Ten Acres, Wayland, Mass. This was the first of two social dinner-dances to be held on an annual basis.

New York

A dinner meeting was held February 15 at the Belmont Plaza Hotel. Guest speaker was Edmond P. DiGiannantonio, manager, Marketing for Submarine Signal Operations, Raytheon Company. He spoke on "Electronics in Anti-Submarine Warfare."

Mr. DiGiannantonio said that electronics for anti-submarine warfare has had a remarkable growth over the past five years. This is due to the changing nature and increasing scope of the underseas threat to our national security and because of the serious limitations placed upon defending forces by the marine environment.

He said that future growth appears not less if not more necessary than what has already taken place in the face of a capable and intransigent foe. The sea today and our still limited means for penetration of its secrets favors the submarine as an offensive force. The submarine itself has far from reached the limits of design and materials potential. What remains to be done, in order to obtain and then maintain a minimum margin of security, cannot be done without the help of electronics technology.

Northeastern University

Colonel John D. Evans, Jr., professor of Military Science at Northeastern University was guest speaker at a recent meeting. He discussed the role of the Army Signal Corps in educating those who use the Army communications systems to be brief, concise and complete.

Rome-Utica

A meeting held January 10 at Griffiss Air Force Base Officers Club was attended by 300 members and guests. Among the special guests were members of the Rome Academy of Medicine, doctors from Oneida, Utica and Little Falls, Rome Hospital and City Laboratory Board of Managers. Dr. Charles LaBelle, Academy of Medicine president, presided. Guest speaker Colonel George M. Knauf was introduced by Colonel Lindsay J. Ervin, commander, 2845th USAF Hospital, Griffiss Air Force Base.

Colonel Knauf, staff surgeon, Air Force Missile Test Center, Patrick Air Force Base spoke on "Medical Aspects of Space Flight." Speaking primarily about Project Mercury, whose mission it is to get man into a modest orbit around the earth, Colonel Knauf said the prime concern of the project is the astronaut's safe return to earth. This involves much in the way of preliminary experimentation and observation, he pointed out.

He stressed the seriousness of the project and the dedication of the scientists working on space flight. Colonel Knauf, who has been described as the man "directly responsible for the medical aspects of space," estimated that a safe space flight for a 150-pound man would require some 500 pounds of additional auxiliary equipment to be boosted up by the missile rocket. He emphasized that each phase of the project depends on the step immediately preceding it.

Syracuse

Burton P. Brown was guest speaker at the January 11 dinner meeting held at Drumlins Country Club. Ninety-nine members and guests attended the meeting. The business part of the meeting included the re-election of the existing slate of officers and the term of non-officer members of the board of directors extended to three years.

Mr. Brown is Manager, Systems Development Engineering in the Missile Detection Systems Section of the General Electric Company's Heavy Military Electronics Department. He described the development of the Air Force Ballistic Missile Early Warning System (BMEWS), using slides taken at Greenland.

Seventy-six members attended the February 8 dinner meeting at the Sheraton Syracuse Inn. Guest speaker was Colonel Glen S. Waterman, director of Test Operations for the Advent Management Agency, Ft. Monmouth, N. J.

Colonel Waterman's subject was "Space Communication." He explained many of the problems involved in missile development and outlined our current plans for developing reflective and repeater missiles for communications explaining the relative advantages of each. Following the talk there was a question and answer period.

AFCEA national president Benjamin H. Oliver, Jr., will speak at the April 12 meeting at the Country House.

REGION B2

Dayton-Wright

A joint meeting of the Armed Forces Management Association, Institute of Radio Engineers and the chapter was held January 26 at the Wright-Patterson AFB Officers Club. Special guests included Brigadier General and Mrs. Allman T. Culbertson and Major General and Mrs. W. A. Davis.

Major General Joseph R. Holzapple, commander, Wright Air Development Division, Dayton, Ohio, was the featured speaker for the dinner meeting. His subject was "Objective Management Within Subjective Environment." He said that in the Air Force today so many weapon systems are dealt with, each so complex, each so specialized, that each becomes critical.

"Today," he said, "perhaps for the first time in human history, we are consciously concerned about the management process. We are searching constantly, almost desperately, for techniques or procedures that will enhance the speed, accuracy and validity of our decision making." He said that we are intimately concerned, whether consciously or not, with the task of increasing the quantity of objectivity in those decisions, and with overcoming the "subjective input data" that may tend to warp our judgments.

REGION C

Augusta-Ft. Gordon

Direct Distance Dialing call to Honolulu, Washington, D. C., Fort Monmouth, N. J., and Albany, N. Y., highlighted the chapter meeting held February 17 at the Richmond Hotel.

John Owen, district manager, Southern Bell Telephone and Telegraph Co., was in charge of the program. Calls were placed to the Weather Bureau in Honolulu; Major General R. T. Nelson, Chief Signal Officer, and Colonel W. J. Baird, USA (Ret.), AFCEA general manager, in Washington; General B. H. Pochyla, Signal Training Center commander, and Major General William D. Hamlin, Fort Monmouth commander, at Fort Monmouth; and Benjamin H. Oliver, Jr., AFCEA national president, at his home in Albany.

Kelly Mosley, regional vice president, reported to the 100 members and guests present that the local chapter had increased its membership to 308, making it the largest in the eight-state Region C.

Gulf Coast

A meeting was held February 6 in the banquet hall of the Airmans Club, Keesler Air Force Base. Fifty-five members and guests attended.

Newly elected president Howard D. Yund presided at the meeting. Program plans for the current year were discussed by Major John W. Gledhill, 1st vice president, and the Southern Bell Telephone Company film "Gateways to the Mind" was shown.

Middle Georgia

An organizational meeting was held January 31 at the Southern Bell Telephone and Telegraph Company Conference Room. Thirteen attended, including Gus Wilson, director of the Atlanta chapter.

The following officers were elected: president, Nelson Rodger, RAFB; vice president, Joe Andrews, WMAZ-TV; vice president, Major Alan Loewenthal, RAFB; secretary and treasurer, J. D. Walker, Southern Bell Telephone and Telegraph Co.

Mr. Wilson gave a short talk on the history and purpose of AFCEA.

Pensacola

The initial meeting of the chapter was held January 27 at the Naval Air Station Golf Club House. The 15 who attended included representatives from the Southern Bell Telephone and Telegraph Co., the Philco Corp., the Federal Aviation Agency, the Naval School of Aviation Medicine and the Naval Air Station.

The new chapter was formed around a nucleus of thirteen members of the Northwest Florida chapter to create a stronger and more diversified representation in the immediate vicinity of Pensacola.

During the meeting the following officers were elected for the coming year: Lieutenant Commander H. M. Young, president; John R. Forstall, 1st vice president; James W. Smith, 2nd vice president; Daniel E. Hansen, secretary and treasurer. A membership committee and a constitution preparation committee were appointed. It was planned to appoint additional committees for chapter activities.

The chapter charter was approved at National Headquarters on February 14.

REGION D

South Texas

A dinner meeting was held February 16 at the Kelly Air Force Base Officers Club with guest speaker Dr. Robert J. Collins of the Bell Telephone Laboratories. Dr. Collins reviewed the principle underlying optical maser action and discussed experiments with the light emission from an optical maser.

The 7th Annual Engineers Joint Dinner-Dance was held February 17, Pearl Corral, San Antonio, with the chapter a participating group.

The March 15 meeting featured Gene Smith of Texas Instruments in a talk and demonstration of "Microcircuits." The April 12 meeting will feature a program on "Closed Circuit Television Techniques," by Southwest Radio and Sound Equipment.

REGION E

Chicago

The chapter held the largest meeting in its history on February 23 when guest of honor and principal speaker was Major General R. T. Nelson, USA, Chief Signal Officer. The meeting was held at the new Teletype Corporation plant in Skokie, Ill., with 419 members and guests attending. A tour of the factory and laboratories preceded the meeting.

In his speech, General Nelson made a bid for industry assistance in Army cost reduction activities. Expressing concern at "the ever-increasing cost of equipping our combat forces," he challenged industry to find ways in which these costs might be reduced. "Price *is* an object," he emphasized.

Reviewing actions taken by the Army, and specifically the Signal Corps, to reduce costs and insure "more equipment for the military forces for the same amount of money," General Nelson said that such efforts must be a mutual endeavor of the "Army-Industry team upon whom our nation places such vital dependence."

The visitors were welcomed to Teletype Corporation by president M. T. Goetz. General Nelson was introduced by Walter H. Pagenkopf, Teletype's vice president, manufacture, who served as host for the evening.

REGION F

Arizona

The March 10 meeting, which was co-sponsored by Radio Corporation of America, was held at Davis-Monthan Air Force Base Officers Club. Guest speaker was Ralph Montijo, RCA, who presented a talk on "How Data Processing Affects Our Way of Life."

Another highlight of the meeting was the presentation of the group member certificate to Pan-American World Airways. This is the first time the chapter has been responsible for sponsoring a group membership for a national concern.

Santa Barbara

Captain William Scarpino, commanding officer of the Naval Missile Facility at Pt. Arguello, discussed "the new Navy" at the February 10 meeting held at Montecito Country Club. He said that there is a greater need for scientists and technicians in the Navy today than ever before and that not enough young people are taking up scientific endeavors.

Describing the weapons currently on hand in the Navy arsenal, Captain Scarpino said, defending the building of nuclear powered aircraft carriers, that 40 per cent of the nation's bombing capabilities lies in the carriers. "They are going to be around for a long time to come," he said.

Correction

In the London chapter report of February 1960 the following were listed incorrectly: Major General Eric S. Cole, C.B., C.B.E., Director of Telecommunications, The War Office; Brigadier Richard B. Ridley-Marten, Chief Signal Officer, Eastern Command; Brigadier W. T. Howe (Ret.).

PACIFIC REGION

Hawaii

The February 13 dinner meeting was held at the Fort Shafter Officers Club with 113 members and guests attending. Special guests were guest speaker Rear Admiral Jack P. Monroe, commander, Pacific Missile Range, and Major General Gordon A. Blake, Hq. PACAF, recently elected regional vice president of the Pacific Region.

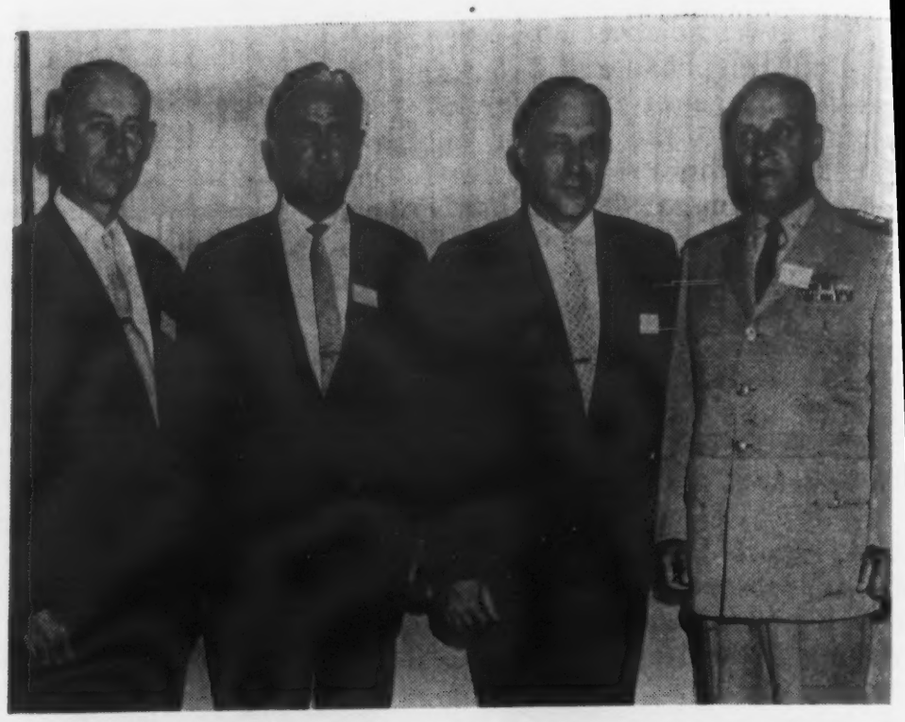
Admiral Monroe spoke on Pacific Missile Range operations. He also said that although the first man in space will "probably speak Russian," the people of the United States should stop lamenting past mistakes. "We have every reason to be confident in our ability," he said, citing great depth and preparedness in the ballistic missile field and the U. S. satellite program.

Marianas

The installation of officers for 1961 was held January 28 at the home of Harry Engel. The occasion marked the first Ladies Night and 150 members and their ladies and guests attended.

Special guests included: Secretary A. M. Edwards, of the Government of Guam; Rear Admiral W. A. Wendt, USN, commanding officer, Naval Forces, Marianas; U. S. District Judge Eugene Gilmartin, Government of Guam; Colonel Ellsworth Powell, USAF, deputy base commander, Andersen AFB; Brigadier General Jesse Covh, USMC (Ret.), director of safety, Government of Guam; Captain G. H. Duffy, USN, commanding officer, U. S. Naval Station; Captain P. W. Robert, USN, CEC, PWC, commanding officer; Captain Van Dyke Johnson, USN, commanding officer, SRF; Captain C. H. Clark, USN, commanding officer, U. S. Naval Air Station.

Judge Gilmartin installed the new chapter officers.



Syracuse—(photo left) Pictured at a recent luncheon meeting are: (L to R) VAdm. R. H. Rice, USN (Ret.), Syracuse University Research Corp.; chapter president C. W. Getz, New York Telephone Co.; Capt. J. E. Thompson, USN, chapter vice president; guest speaker W. F. Bowin, supervisor of Mathematics and Industrial Artists, chief of Closed Circuit Television Operations, City of Syracuse School System; Brig. Gen. J. K. Wilson, Jr., USA (Ret.). (photo right) **Hawaii**—At the February 13 meeting (L to R) Maj. Gen. G. A. Blake, RAdm. P. H. Ramsey, Col. W. A. Simpson and RAdm. J. P. Monroe.

Middle Georgia—(photo left) Newly elected chapter officers (L to R) are: president, Nelson Rodgers; vice president, Joe Andrews; secretary, J. D. Walker; vice president, Alan Loewenthal. (photo right) **New York**—Guest speaker E. P. DiGiannantonio (left) and chapter president Glenn Montgomery at the February 15 meeting.

Augusta-Ft. Gordon—(photo left) At the February 16 meeting: (L to R) Col. R. R. Creighton, national committeeman; P. K. Jones; John Owen; Kelly Mosley, regional vice president; Col. T. J. Trainor, chapter president. (photo right) **Marianas**—U. S. District Judge Eugene Gilmartin, installation officer, presents the chapter charter and gavel to Capt. C. J. Alley, USN, newly elected president. Pictured are: (L to R) Lt. Cmdr. J. L. Gates, USN, retiring executive vice president; L. V. Richmond, retiring vice president for programs; Judge Gilmartin; Capt. Alley; Maj. F. A. Wall, USAF, elected executive vice president; Lt. Cmdr. W. N. Scott, USN, elected secretary; 1st Lt. J. C. Anderson, USAF, elected treasurer.

Chicago—Officers and directors host Maj. Gen. R. T. Nelson, CSigO, at luncheon at the Palmer House during his visit there on February 23. Gen. Nelson was guest speaker at the evening meeting held at Teletype Corp. plant in Skokie, Ill. Seated (L to R) C. H. Stone, R. K. Fried, Col. T. W. Gilman, W. L. McGuire, Gen. Nelson, W. H. Pagenkopf, S. H. Levey, W. H. Flinn, C. E. Trexler, H. Bendtsen. Standing (L to R) R. Morey, L. A. Pereira, Lt. Col. W. L. Lambertus, Col. J. H. Fulton, USA, B. Quisenberry, Col. J. R. Ourand, USAF, A. P. Lancaster, Capt. R. H. Northwood, USA, I. Koss.

Greater Los Angeles—Guest speaker Lt. Gen. F. H. Griswold, USAF, vice commander-in-chief, Strategic Air Command, at the January 18 chapter meeting.

Washington—Col. W. H. Congdon, USAF, director, Systems Management, Hq., AFCC-DD, Hanscom Field, Bedford, Mass., speaking at the February 2 meeting.

Dayton-Wright—(left) Maj. Gen. J. R. Holzapple, commander, Wright Air Development, guest speaker, and H. E. Walker at the January 26 meeting.

Association News

Board of Directors Meets

A meeting of the Board of Directors was held March 8 at the Army Navy Town Club, Washington, D. C. National president Benjamin H. Oliver, Jr., gave a comprehensive and informative presentation covering many of the important activities of the Association during the two year period of his presidency. The report was supplemented by the following statistical charts:

(1) AFCEA Income, Expense and Net Income from 1957-1961.

(2) AFCEA Membership Increase from 1957-1961.

(2A) Revenues from Membership from 1958-1961.

(3) Advertising Income (Net) from 1957-1962.

(4) Convention Income (Net) from 1957-1962.

Colonel W. J. Baird, USA (Ret.), AFCEA general manager, gave a report on SIGNAL and the chapters. He thanked Major General Harold W. Grant, USAF, Director of Telecommunications, for his support in connection with SIGNAL's special March Air Force issue. He stated that the Air Force ordered 100,000 copies. He also discussed plans for the 15th Annual Convention.

Colonel Baird stated that an editorial by him and a Convention ad by Mr. W. C. Copp will appear in the March 16, 1961 issue of *The Washington Daily News*, circulation 180,000.

Maxson Electronics Joins Association

Maxson Electronics Corporation has joined the Association as a group member. Joseph W. Stehn, director of military sales, was named company representative.

Others named to membership by the company are: Peter F. Barry, N. E. district representative; Anthony R. Pignoni, manager Eastern sales district; Donald S. Levine, product sales; Frank J. Shannon, manager, Washington, D. C. district; Robert J. Stein, Midwestern district; Eugene J. Cronin, manager, product sales; W. L. Maxson, Jr., vice president; Charles J. Schmidt, director, Radiation Lab; Murray Simpson, technical director.

Science Project at Santa Barbara Chapter

Sixteen scientific-minded students, representing the Santa Barbara, San Marcos and Bishop Garcia Diego High Schools, along with their teachers, participated in a recent field trip to Servomechanisms, Inc. This was the third field trip under the auspices of the chapter under their "Recruits for Science" project directed by Lieutenant Colonel H. H. Dillard, USAR (Ret.). Other members of the chapter present were Rear Admiral C. C. Ray, USN (Ret.), Milton Roth and W. W. Montgomery.

Hogan Faximile Corp. New Group Member

Hogan Faximile Corporation has become a group member. The company does research and development in graphic recording. Theodore F. Whitmarsh, general manager, will act as representative to National Headquarters.

Those named to membership are: John W. Smith, chief engineer; John V. Hogan, sales manager; Jerry H. Watner, assistant sales manager; David Shaler, assistant chief engineer; Hugh C. Ressler, senior project engineer; Gerald G. Murphy, project engineer; Irving Lieblich, chief chemist; William H. Burnett, engineering coordinator; Thomas P. Mullen, comptroller.

Lexington-Concord chapter president Lt. Col. Donald V. Mayer (left) presents a group member certificate to J. Vance Holdam, Jr., vice president, Laboratory for Electronics, Inc., at the January 27 chapter meeting. LFE is the first corporate member signed up by the chapter since its recent organization.

NEW MEMBERS

Listed below are new members of AFCEA who have joined the Association during the month of February. Members are listed under the chapter with which they are affiliated. Amateur radio operators are listed with their call letters.

Arizona

Lewis C. Corey
Howell Travis Whiting
David Lyndon Woods

Atlanta

C. Everett Jones, Jr.
Harold L. Lipham
Cecil G. Lively
William L. Parker
T. Clack Tucker

Augusta-Ft. Gordon

Maj. C. S. Adler, USA
2nd Lt. W. L. Barrentine, USA
SFC E. L. Billingsley, USA
Capt. K. J. Bisek, USA
M-Sgt. K. B. Busby, USA
Andrew P. Covar
Julian D. Dean
2nd Lt. R. L. Dodge, USA
2nd Lt. C. W. Downs, USA
2nd Lt. R. N. Dunbar, Jr., USA
M-Sgt. Glenn Dunlap, USA
Capt. H. R. Elliott, Jr., USA
S-Maj. Otto Fischer, Jr., USA
2nd Lt. F. P. Follett, USA
Capt. E. A. Fulk, USA
2nd Lt. E. G. Furlong, USA
2nd Lt. R. A. Gagliano, USA
Allen R. Galloway, USA
Jewett M. Harris
1st Lt. Henry J. Harvey
2nd Lt. G. R. Hechinger
2nd Lt. J. P. Henry
M-Sgt. J. D. Hensley, USA
M-Sgt. J. J. Johnson, USA
2nd Lt. B. K. Kellom, USA
Maj. R. A. Kobb, USA
2nd Lt. D. C. Krathwohl
2nd Lt. H. R. Krause, USA
Howard D. Leonard
2nd Lt. Bobby A. Love, USA
2nd Lt. L. A. Malechek, Jr., USA
2nd Lt. J. E. Malmberg, USA
2nd Lt. S. W. Meitler, USA
Capt. Jesse A. Murga
2nd Lt. J. F. Neary, Jr., USA
Jack N. Niland
1st Lt. A. L. Norton, USA
2nd Lt. R. P. J. O'Dwyer, USA
SFC J. A. Parchman, USA
Capt. T. O. Peterson, USA
2nd Lt. E. G. Preston, USA
2nd Lt. B. J. Rathke, USA
Sgt. Maj. W. E. Reynolds, USA
MSgt. J. K. Richards, USA
Grady F. Ridlehoover
Capt. B. F. Robertson, USA
2nd Lt. G. E. Roll, USA
Walter J. Schaubhuth, USA
Capt. Durward F. Silas, USA
Harold R. Smith
SFC Joseph M. Solis, USA
M-Sgt. W. G. Stamper, USA
Capt. Joseph D. Strowd
1st Lt. J. Y. Takamoto, USA
William B. Towne, Sr., K4KAR
S-Maj. Oscar F. Trost, USA
Owen I. Tsukiyama
Harold W. Tucker
Capt. Rodrick Turnbull, USA
Col. John R. Turner, USA
M-Sgt. Thomas R. Vail, USA
Capt. Robert H. Wade
1st Sgt. R. W. Waits, USA
2nd Lt. L. H. Warshawsky
Clarence E. Weissenbaurger
2nd Lt. W. S. White, Jr., USA
Capt. F. S. Whiting, USA
2nd Lt. John F. Wilson
2nd Lt. J. F. Wright, USA

Baltimore

Lt. Col. Ollie J. Allen
S. Fred Greenberg
John J. McWalters
Joseph Neal Schaffer

Boston

Gerald J. Barton
Richard B. Bean
Lt. Col. Alvah K. Borman
R. Neal Breesman
G. H. Gage
P. N. Hambleton
Joseph A. Strong
M. R. Yeiter

Chicago

Capt. W. G. Andrews, Jr., USA
George T. Brady
Robert S. Carson
Richard J. Cavanaugh
Karl W. Clayton
Ethel-Lynne Cross
D. S. Frankel
C. Wayne Franklin
Capt. W. H. Freeman, USAF
Joseph E. Hrycej
Carl Korn
Edwin E. Logan, W8AWL
Charles Travis Marchall
Col. J. R. Ourand, USAF
Robert Touhey
Donald F. Wilds

Dayton-Wright

James L. Dunaway
Richard N. Earnshaw
Michael S. Gazella
David L. Gaede
John L. Haggerty
W. G. Ingling, W8SVI
Willard C. Nearing
James P. Parden
Robert J. Stein

Decatur

Harry F. Armstrong
Loudene O. Boehm
John L. Butler
Capt. John J. Lacey
Franklin L. Post

Detroit

Ralph R. Blanchard

Ft. Monmouth

Charles D. Donohoe
Raymond N. Gale
Maj. R. A. Kirkpatrick, USA
Pfc. W. L. Tucker, USA
John E. Waters, Jr.
Eugene A. Wodeshick
Robert J. Wright

Greater Los Angeles

Joseph Campbell
Elmer H. Conklin, K6KA
LCdr. H. M. Cortner, USN
Warren H. Davis, W6IBD
Col. F. J. Elser, USA, Ret.
Wendell Mark Fales, W6AGG
Dudley Edwards Foster
Thomas R. Haher
Joseph Jackson Innes
Jacques Robert Lehman
Sam Mumford
James L. Pyle
R. P. Rowlett
William John Szittya
K. N. Thanstrom
Richard P. Turner

Gulf Coast

Lt. Col. E. H. Field, USAF
S-MSgt R. E. Hare, Jr., USAF
Elbert S. Lambert
Joel B. Peters

Hawaii

Harvey L. Demello

Saburo Harada
Ronald D. Higgins
Curtis R. Peterson

Kansas City

Joseph E. Sweets
George Summerscales, Jr.

Korea

John Carleton Feltus
2nd Lt. Lyle J. Kaufman
Capt. J. E. Masterson, USAF

Lexington-Concord

Norbert E. Andres, Jr.
Mark Caplan
Norman W. Downes
Walter Lee Elkins
Joseph S. Henderson
Capt. S. L. Kreisher, Jr., USAF
Paul W. Lunn
LCdr. John Ayer Maynard
Joseph E. Tolle
Lt. Col. C. R. Wells, Jr. USAF
John P. Zagoudis

London

Maj. Gen. E. S. Cole, USAF
N. Elson
R. A. MacDonald
Charles F. Rouse

Louisiana

LCdr. C. Glenn Cook, USAF
M. H. Gaston
Trudeau J. Hogue, Jr.
William A. St. John, Jr.

Marianas

William R. Butler
John R. Lopatka
MSgt. J. M. Ulman, USAF

Middle Georgia

Elmer H. Adams
John Howard Absalom
Joe W. Andrews
John N. Booth
Morris C. Croft, Jr.
C. E. Denight, W4NDR
William Rabon Dorsett
Jim T. Elliott
John Carl Funderburk
E. H. Gibson
Maj. C. B. Grosshart, USAF
Maj. R. L. Hill, USAF
John C. Jennings
William M. Jennings
Alan M. Loewenthal
Kenneth A. McClung
Larry P. Morgan
Ed M. Nobles, W4KNP
Fred W. Okey
James D. Popwell
Maj. M. L. Price, USAF
W. J. Priester, Jr., W4OZL
Paul Reehiling
Lt. Col. S. E. Rodby, USAF
Nelson H. Rodgers, W4FZE
Thomas R. Shockley
William Lane Ware
Roger W. Watson
Hoyt A. Wiggins
Fred Williams
Abrom Willis
Charles W. Wilson

Montgomery

Hugh R. Evans

New York

P. Barry
Scott L. Barton
Julius Bender
James A. Bianco
Alexander A. Brown, Jr.
William H. Burnett
Salvator S. Calafati, Jr.
Thomas P. Cassidy
Clayton A. Cool
Eugene J. Cronin
Rolf Dalane
John B. Darrah
J. A. Doremus
Lt. Col. D. C. Drayton
Robert Emers
Ira Fertik
William G. Fitzsimmons
Fred Gershon
Maj. M. J. Gibney, Jr., USA
Thomas Gottlieb
John Francis Griffine
Frank R. Healey, Jr.
Michael Helfer
Alfred A. Hennings
Curtis H. Hoffman
John V. Hogan
George Eliot Kaufer
Harry A. Kohler
Sam Kratter
Jeffrey Lang
D. S. Levine
S. S. Levine
Irving Lieblich
Paul McCaul
Kenneth May
W. L. Maxson, Jr.
J. P. Molnar
Thomas P. Mullen
Gerald G. Murpht
H. K. Onstott
Jack D. Phelan
A. R. Pignoni
Hugh C. Ressler
John Ricci
Franz E. Ross
Winston J. Ross
Nicholas Michael Russak
Carl J. Schmidt
Stanley Schuster
David Shaler
Philip Shapiro
Murray Simpson
John W. Smith
S. Donald Smith
Robert M. Spiegel, P. E.
Joseph W. Stehn
Louis J. Van Orden
Robert Wals
Jerry H. Watner
Robert Weber
Theodore F. Whitmarsh
Douglas Williams
Robert Young

North Carolina

1st. Lt. R. D. Alspaugh
Capt. Harold A. Barry, USA
Maj. Frank R. Brown, USAR
Col. Sam J. Clark, USA
Thomas K. McLaughlin

Northeastern University

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K. P. Todd
James R. White

NEWS ITEMS AND NEW PRODUCTS

Exports of electronic products from the United Kingdom to the United States in the first nine months of 1960 totaled approximately $13.7 million, a 3 percent drop from the corresponding period of 1959.

The Electronics Division, Business and Defense Services Administration, U. S. Department of Commerce reports that data provided on a quarterly basis by the British Radio Equipment Manufacturers' Association show that electronics sales to the United States were reasonably well maintained through September 1960, although shipments of record playing mechanisms, the leading items in this trade, declined about 27 percent from the 1959 level. There was a sharp drop also in sales of phonograph parts and accessories, and moderate declines were indicated for electron tubes and receivers. These losses were offset to a large degree by substantial gains in shipments to the United States of commercial electronic equipment, and miscellaneous components and accessories, including such apparatus as test equipment, electro-medical apparatus, and recording tapes.

Japanese electronic production during the first nine months of 1960 totaled $856 million, a 31 percent increase over the $655 million total during the corresponding period in 1959.

Production of television receivers and radio receivers accounted for one-half the total Japanese electronics output in the first nine months of 1960.

Production of these items which expanded rapidly in 1959 showed signs of leveling off during the third quarter 1960, while a strong upward trend appeared in the production of tape recorders and radio phonographs.

Gains in production of these items in the third quarter 1960 over third quarter 1959 output were as follows: Television receivers, 2 percent; radio receivers having 3 or more transistors, 21 percent; radio-phonographs, 134 percent; and recorders, 81 percent. Output of tube type radios declined 29 percent in the third quarter 1960 from the third quarter 1959.

Significant gains were made in Japanese production of a number of other products in January-September 1960 over January-September 1959. Electronic computers increased by 172 percent; industrial measuring and control equipment, 73 percent; receiving tubes, 45 percent; transmitting and special purpose tubes, 50 percent; transistors, 34 percent; transformers, 87 percent; and amplifiers for "hi fi," 157 percent, to $3.2 million.

• • •

A promontory of land in Antarctica has been named in honor of a National Bureau of Standards scientist. Garth Stonehocker of the Boulder Laboratories was notified that a point near Wilkes Station has been named Stonehocker Point in recognition of his contributions while a participant in the U. S. scientific program in Antarctica during the International Geophysical Year.

Stonehocker was in charge of the ionospheric program at Wilkes Station from 1957-1958 and operated a radar-like sounder to obtain data of the ionosphere. Stonehocker was one of the first to realize that solar caused ionospheric disturbances were occasionally being detected sooner in the Antarctic than at warning stations in other parts of the world. These phenomena, designated polar cap absorption events, are now being intensively studied in both the Arctic and Antarctic regions.

• • •

The C&O Railway and Smith-Corona Marchant Inc., have signed an agreement by which the latter will lease to the C&O a million dollar communications system to be designed, manufactured and installed by the Kleinschmidt Division of SCM Inc.

The system is expected to speed communications between transportation and traffic centers and permit more efficient freight car utilization. The teleprinter network will interconnect by use of 7400 miles of C&O communications circuits, some 130 of its line-to-road offices with its Car Location Information Center at Huntington, West Virginia.

• • •

Under an Air Force Research and Development Command contract, ITT Federal Laboratories will engineer and construct an over-the-horizon radio link in cooperation with the Rome Air Development Center at Griffiss AFB to evaluate new concepts in radio transmission and reception. The system will connect Ransomville and Verona, New York, a distance of 170 miles. The link will use the troposphere to scatter radio signals to large receiving antennas.

The experimental system will transmit the same signal simultaneously along seven different paths separated by fractions of a degree. Seven transmitters will be used to generate the signals. These then are beamed against a 28-foot antenna that will direct the transmission toward the troposphere. Fourteen receivers at the distant terminal, each equipped with a hypersensitive device to minimize static and thermal noise will acquire the scattered beams and feed them to a combining system. The resulting combined signal will incorporate the best characteristics of all seven.

• • •

The following news items were taken from *Current Review of the Soviet Technical Press* distributed by the Business and Defense Services Administration, Office of Technical Services, U.S. Department of Commerce.

"Soviet scientist N. I. Kabanov was awarded a diploma, as recently reported (see SIGNAL, February, page 64) for a discovery officially formulated as: 'The radio waves which are reflected by the ionosphere are partially scattered by the earth's surface as they reach the earth; as a result, part of the scattered energy returns to the radiation source where it can be registered.' Another news report linked the discovery to the development of long-range radar by which, theoretically, it would be possible to look into any corner of the globe, and urged participation of radio amateurs in conducting experiments in the short-wave range for the purpose of achieving sharply aimed transmissions with a minimum of radiated energy. In his own account of his studies during the period 1946-1959, N. I. Kabanov repeats the claim that although non-Soviet scientists have had several 'almost correct' answers to the problem of long-range backscatter propagation of radio signals reflected by the earth, these an-

New Collins DC system insures uninterrupted communication...when you need it most!

Now... security against even momentary outages during power-disrupting storms. Collins' dc-powered Microwave and Carrier Systems operate directly from float-charged batteries — eliminating rotating machinery. The results: improved reliability, reduced power drain, lower maintenance, decreased noise and elimination of standby generators. Several voltage combinations are available, enabling you to select the one that best integrates with your existing plant. For technical literature, write Collins Radio Company, Texas Division Sales, 1930 Hi-Line Drive, Dallas 7, Texas.

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L. Berkley Davis (left), General Electric vice-president, presents trophies to John T. Chambers, W6NLZ, (center) and Ralph E. Thomas, KH6UK, joint winners of the ninth annual Edison Radio Amateur Award for public service. Using home-made and surplus Army equipment, the pair set a one-way communications record of 2,540 miles on 432 megacycles last July. For complete story see SIGNAL, December 1960, page 60 and SIGNAL, February 1961, page 68.

swers have not been conclusive. According to Kabanov, Soviet scientists obtained important scientific and practical results as early as 1946-1947. In the course of various experiments, which covered a full 11-year cycle of solar activity (1947-1958), operational frequencies in the 5.5-20 mc range were used. With transmitter power of only 'several kw' return signals were obtained from locations 2500-3000 km away. These distances were extended to 10,000-12,000 km 'and more' by means of increased transmitter power and high-gain antennas. Kabanov gives credit to Western achievements in more recent years, noting that they give positive proof regarding the applicability of long-range backscatter propagation in detecting launchings of ballistic missiles and low-flying targets far beyond the horizon line."

The above item appeared in *Radiotekhnicka i electronika* v. 5, No. 10, Kabanov, N. I., Oct. 1960.

"Inventions of electronic devices by amateur radio technicians are noted as an important contribution to industry and science. Among such devices is a supersensitive 'ultrathermostat' for temperature control invented by V. Kazaskiyand I. Tsimbalistov. This device is made up of a dc amplifier loaded by an electric bulb submerged in water. The filament of the bulb, heated by the cathode current of the output stage, is the heat source. Uniform temperature of the water is maintained by an additional motor which causes consistant movement of the water. The temperature sensor is in the form of a spiral pipe filled with toluol which expands greatly when heated, activating a sensitive photoresistor-operated device which regulates the amplifier's gain in a closed control loop. This system can detect and adjust temperature variations of only 10^{-4} degrees. Another device, for nondestructive weld testing, invented by D. Ivanov, is in the form of an attachment which operates with a 6E5 'magic eye' tube. The unique feature of this device is that the welding seam is covered with a wide piece of magnetic tape and magnetized by means of a special coil. The tape is then 'played back' and moves slowly through the playback head of the device. Any defect in the welding seam, such as a crack or a cavity, causes a variation in the intensity of magnetization and thereby produces an electric pulse in the playback head. Such a pulse is reflected instantly by a 'widening' of the dark sector on the screen of the 6E5 tube."

The above item appeared in *Tekhnika molodezhi*, No. 9, September 1960, by Mavrodiadi, V., and L. Ragvin.

"Professor Stefan Manczarsky, Scientific Secretary of the Committee of International Geophysical Cooperation of the Polish Academy of Sciences, has developed a theory of propagation of radio waves which explains the amplification of radio waves in the ionosphere. Manczarsky asserts that: 1) the ionosphere is wavy rather than flat as was believed previously; 2) the field intensity of radio waves is naturally amplified in the ionosphere, the processes being similar to those taking place in klystrons; and 3) the atmospheric discharges produce fast electrons, which under certain conditions cause amplification of radio waves. Using the parameters of the ionosphere in a study of ionospheric and exospheric radio echoes, Manczarsky calculated the attenuation of short waves propagating around the earth. He found that the attenuation was less when a radio wave travels along the earth's magnetic lines than when it propagates perpendicularly to these lines, being so high in the latter case that reception of radio echoes would be difficult without the natural amplification in the ionosphere which he assumes."

The above item appeared in *Przeglad techniczny*, No. 43, Oct. 26.

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The National Bureau of Standards will present a three-week course in Radio Propagation this summer from July 31 through August 18. The course will provide access to the latest advances in radio propagation research and show how this knowledge can best be applied to the design of systems for radio communication and navigation. It will consider the entire range of usable radio frequencies and extend into the types of propagation which are being explored for the future.

Registration will be limited. Further information is available from Edmund H. Brown, Educational Director, Boulder Laboratories, National Bureau of Standards, Boulder, Colorado.

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A one-day meeting on High Precision Connectors will be held June 29, 1961 at the Boulder Laboratories in Colorado. The objective of the meeting is to reduce those errors in precision measurements which are due to connector uncertainties in coaxial equipment at radio and microwave frequencies. It is expected that this can be achieved by agreement on design, size, tolerances, etc., of a minimum number of connectors which will be used by standardizing laboratories, and incorporated in manufactured instruments capable of high precision.

The morning will be devoted to papers giving quantitative information on high precision connectors and the afternoon to a round table discussion on the same topic. Papers and discussion are invited on such subjects as the influence of mechanical and electrical tolerances on the residual discontinuity of connectors, residual discontinuities in coaxial lines and cables, high precision coaxial lines, dielectric material for supports in connectors, support structures for connectors, power handling capacity, upper frequency limits of connectors, adapters for differing diameters and impedances, measurement methods and results, stability and wear properties of electrical metals, surface plating and maintenance, adapters to existing connectors, fabrication methods, leakage resistance, recommended sizes, characteristic impedence, frequency ranges, maximum VSWR, environmental performance,

current and anticipated needs, and other topics which may aid agreement on an optimum coaxial connector for high precision work and national and international agreement.

Abstracts of papers should be submitted by May 1, 1961 to R. C. Powell, National Bureau of Standards, Boulder, Colorado.

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A service for companies that wish to sponsor engineering scholarships but do not have scholarship administrative facilities has been announced by the Hertz Engineering Scholarship Foundation.

The service is performed without charge. Administrative costs are absorbed by the Hertz Foundation. The Hertz Foundation, supported by the personal fortune of John D. Hertz, assists engineering education in two ways: Scholarships are granted to deserving students directly from the Foundation's own funds, and it also supplies the administrative machinery for scholarship funds provided by others, as described.

Additional information may be obtained from the Hertz Engineering Scholarship Foundation, 1314 Westwood Boulevard, Los Angeles, California.

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The Moore School of Electrical Engineering of the University of Pennsylvania has announced a special summer session on recent developments in the field of electrical engineering. Four two-week Programs will be given during the period June 4 through July 15. The Programs include: Modern Radar Techniques; New Devices for Amplification and Switching; Communication Theory and Information Handling; and, Logic, Switching Systems and Automata.

For further information write to Morris Rubinoff, Coordinator, 1961 Special Summer Session, The Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia 4.

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Over 400 scientists, engineers and production specialists are expected to attend a Missiles and Rockets Symposium at the U. S. Naval Ammunition Depot, Concord, California, April 18-21. Arrangements for the meeting, sponsored by the Bureau of Naval Weapons, are being carried out by the Quality Evaluation Laboratory at the Depot.

Among the scheduled speakers are Rear Admiral E. A. Ruckner, Bureau of Naval Weapons Assistant Chief for Research, Development, Test and Evaluation; Dr. Edward Teller of the University of California and Dr. Theodore Merkle of the University of California Radiation Laboratory.

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The American University, Center for Technology and Administration, is sponsoring the Sixth Institute on Research and Development Administration to be held April 24 through 28. This year's session will cover planning, communication and financing for research and development.

Institute sessions will be held from 9:00 A.M. to 4:30 P.M. The tuition fee is $90.00. Further information may be obtained from Lowell H. Hattery, Sixth Institute on R&D Administration, The American University, 1901 F Street, N.W., Washington 6, D. C.

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The Institute of Radio Engineers, Inc. has been awarded a grant of $10,000 by the National Institutes of Health, and a grant of $5,000 by the National Science Foundation for the support of the Fourth International Conference on Medical Electronics. The 1961 Conference will be held on July 16-21 at the Waldorf Astoria Hotel in New York.

An experimental version of a new telemetry system has been completed by General Electric's Missile and Space Vehicle Department. The new system is expected to be able to beam signals through space approximately three times as far as any telemetry system yet flown.

The system is one of a family of communication systems called Syncrolink that will transmit data the same distance as systems now in use with about one-tenth the power requirement, a G. E. spokesman reports. Syncrolink is a digital system which is classified as Pulse Code Modulaton with Phase Shift Keying (PCM/PS).

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The Pennsylvania State University has established an interdisciplinary curriculum leading to the M.S. and Ph.D. degrees in Solid State Technology. Candidates for degrees will be accepted beginning with the 1961-62 school year.

Degree candidates enrolled in the program may carry out their research and course work in the Colleges of Chemistry and Physics, Engineering and Architecture, Mineral Industries, or a combination of the three. Further information on the

program may be obtained from Dean, The Graduate School, The Pennsylvania State University, University Park, Pennsylvania.

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The Air Force Command and Control Development Division (ARDC) has announced appointment of seven Technical Area Managers in its Directorate of Technology. The new managers are responsible for all work in their particular areas throughout the entire Air Research and Development Command.

Technical Area Managers are: *Communications,* Lt. Col. Sidney Sheets; *Computer and Data Processing Techniques,* Maj. William Harris; *Surveillance Techniques,* Maj. Scott Sterling; *Electronic Techniques,* Maj. James Van Horn; *Electromagnetic Wave Techniques,* Capt. John Hobson; *Intelligence Techniques,* Capt. Leroy Ross; and, *Electromagnetic Vulnerability Reduction,* Mr. William Dix.

• • •

The U. S. Army Signal Corps presented its RIQAP award to the Reeves-Hoffman Division of Dynamics Corporation of America for "consistent production of high-quality quartz crystals over a long-term period."

RIQAP, which stands for Reduced Inspection Quality Assurance Plan, is the highest quality-recognition and honor the Army Signal Corps can bestow upon a manufacturer.

RIQAP, a means for product evaluation and acceptance, is designed to assure the highest quality standards, and to reduce the amount of end product inspection by the Federal Government through increased reliance on the manufacturer's own control policies and practices. It requires "the most advanced quality control methods and test procedures" from the manufacturer. Participation in RIQAP must be by mutual agreement between the contracting manufacturer and the Army Signal Corps.

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RCA Communications, Inc. has announced plans to install an electronic data processing system in their New York headquarters to speed the flow of increasing world-wide radio and cable traffic. RCA Communications transmitted an average of 25,000 paid overseas messages a day last year. The new system is scheduled to be in use in 1962.

The data processing equipment to be used will occupy 3,850 square feet. The special data processor will employ many of the techniques and much of the equipment used in the 601 (RCA's largest electronic data processing system), the 301 and 501. The processor will handle automatically and rapidly all messages sent into it from any channel of communications. The system will handle traffic transmitted by wire lines, microwave, coaxial cable, high frequency radio, tropospheric scatter propagation or satellite communication systems.

By recognizing the various code symbols preceding a message, the processor will identify the type of message, the country it is destined for, the major city to which it should be sent, the route it should follow, the relay points along the line, and the priority the particular message warrants. The system will then send the message through normal transmission channels to its destination.

• • •

Burroughs Corporation has announced a new solid-state electronic information processing system—"a self-regulating, problem-oriented system that is capable of multi-processing and system expansion without reprogramming."

The system, the B5000, is designed to accept programs written in algebra or in English language statements. The built-in ability to process programs written in the Common Business Oriented Language (COBOL) and Algorithmic Language (ALGOL) is to be standard with every B5000 Computer system. First deliveries of the new system will be made in about sixteen months.

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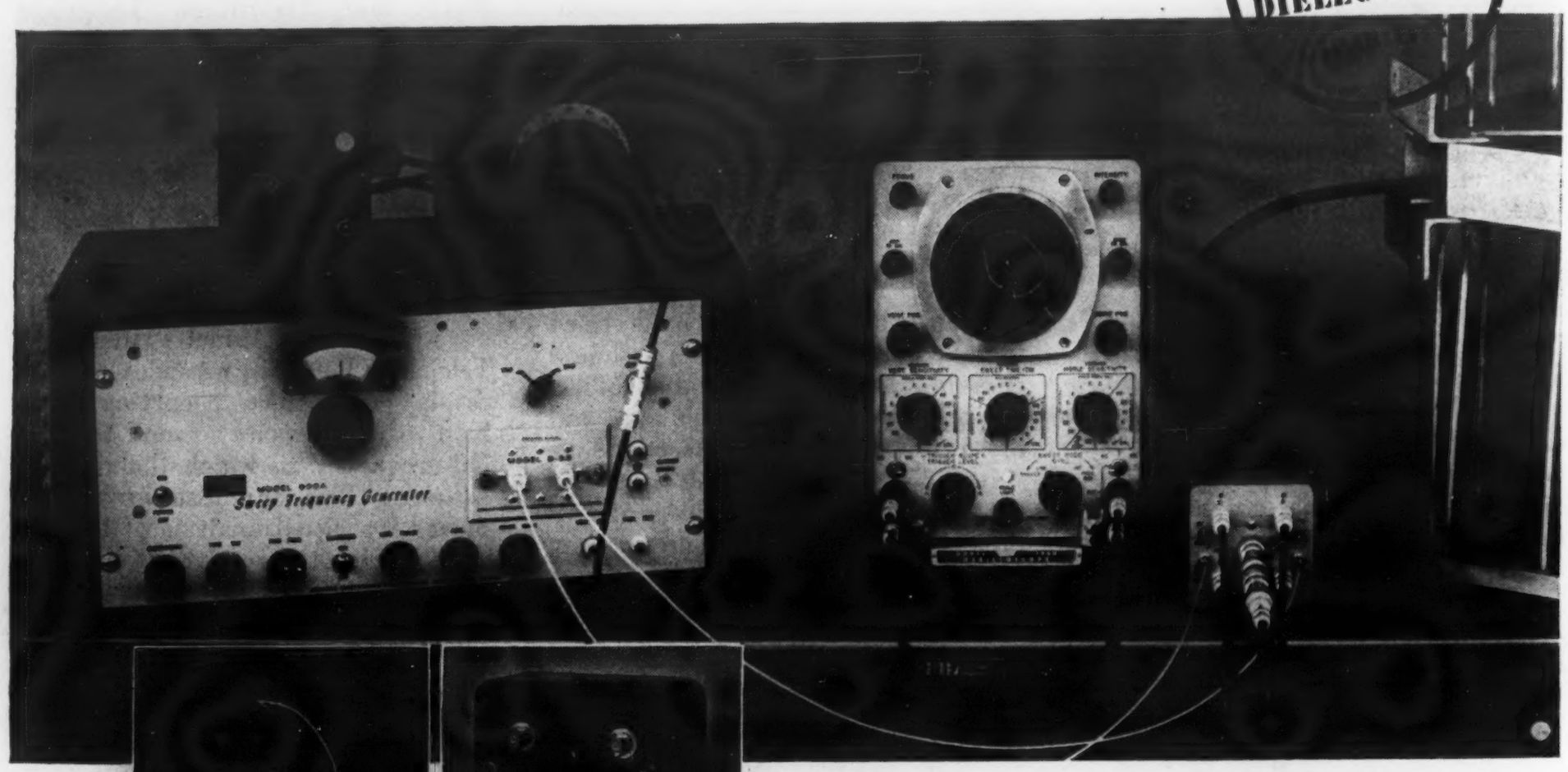
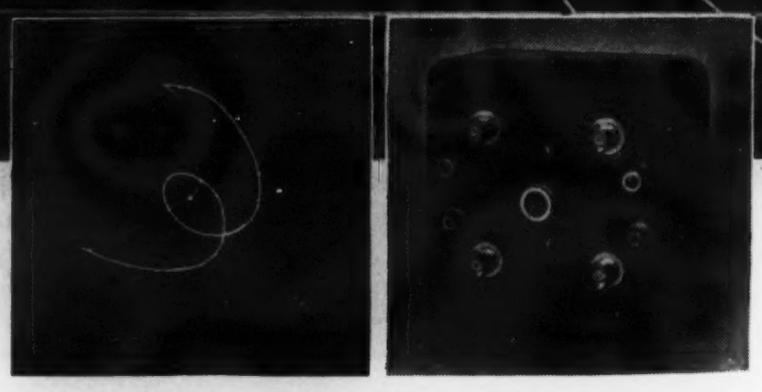
Defense Electronics, Inc. of Rockville, Maryland has developed a Telemetry Display Unit designated Model TDU-1. The unit, designed for use with the DEI Model TMR-1 VHF Telemetry Receiver, provides a visual display of signals occurring in a band of frequencies around the signal frequency to which the receiver is tuned. The unit also provides a means for visual analysis of the signal to which the receiver is tuned.

The input center frequency is 30 mc; sweep width is continuously adjustable zero to 3 mc; amplitude constancy over display range is within 3 db of response at center frequency; resolution is approximately 20 kc; oscillator mean frequency is 25.7 mc; and, power input equals 117 volts 50-60 cycles 95 watts.

The best way yet to measure complex impedances

ANOTHER MEASURE OF DIELECTRIC'S





Here — for the first time — is an approach to the measurement of complex impedance over a band of frequencies that, for speed, simplicity and reliability, surpasses anything yet used.

It's the Smith Chart Plotter, specially developed by Dielectric Products Engineering Company to obtain instantaneous display of impedance as a continuous function of frequency. There are five coupler models spanning 10 to 3000 mc/s.

This unique coupler — along with appropriate auxiliary equipment to form the complete plotter — eliminates the need to tie up highly skilled technical personnel during prolonged test routines that characterize slotted line measurements. As precise as it is versatile and easy to operate, the Plotter functions simply and quickly to deliver peak accuracies.

HOW IT WORKS

With Dielectric's Smith Chart Coupler, a sweep generator sweeps over the frequency band of the unknown load. A continuous trace of impedance versus frequency is displayed directly on the Smith Chart faceplate. This can be either a full scale chart or one expanded to 1.5:1 VSWR. As adjustments are made, impedances change as does the corresponding trace. Since the Plotter is direct viewing, load changes can be observed immediately. When a permanent record is required, the oscilloscope trace may be directly photographed. Or, if preferred, an X-Y chart recorder may be used.

If you're a designer looking for a faster, easier way to obtain more accurate impedance and admittance measurements of diverse components such as antennas, filters, load resistors, transformers and other r-f networks, you'll find the Smith Chart Plotter one of your most essential tools.

For complete description and for details of operation of the Smith Chart Plotter, write for Bulletin 60-3.

SPECIFICATIONS (ALL MODELS)

Nominal impedance	50 ohms
RF input voltage	0.2 volts, rms
Oscillograph signal voltage (0.1 volt input to plotter)	40 millivolts x reflection coefficient
Accuracy of reflection coefficient measurement	
a. Amplitude	± 5% of reflection coefficient ± 0.01
b. Phase	$\pm$ 3 degrees $\pm$ arc tan $\left(\frac{.01}{\text{reflection coeff.}}\right)$
Sweep rate (maximum)	60 sps
Spot rotation rate (maximum for full accuracy)	1000 rev/sec
RF input and output terminals	Type N female
Oscilloscope signal terminals (balanced)	Type BNC female
Automatic level control terminals	Amphenol Series 27 female

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RAYMOND, MAINE

The feasibility of superconducting solenoid magnets producing extremely high magnetic fields has been demonstrated by Bell Telephone Laboratories scientists. In the latest experiment, Bell Labs utilized a superconducting compound of niobium and tin, fabricated and reacted by special metallurgical techniques.

With the new compound, steady-state magnetic fields of 88,000 gauss are possible. The niobium-tin compound becomes superconducting at 18°Kelvin, a higher transition temperature than any other superconductor presently known. Indications are that the niobium-tin material will sustain fields of 100,000 gauss while carrying electrical currents of 100,000 amps per square centimeter of cross section.

• • •

Bomac Laboratories, Inc., Beverly, Massachusetts have developed a new magnetron test set, BLP-002K. Plumbing components include: well-matched coaxial line to waveguide transition; pulling device; folded cross guide directional coupler; thermistor mount; frequency meter; and, waveguide to coaxial line transition.

The modulator capable of producing .5 and 1.0 μs pulses having a peak amplitude of 3.0 kv at 2.0 amperes is provided with an internal trigger source, necessary control and meters, plus test jacks for pulse shape viewing test results through an oscilloscope. The set is available for C-Band or X-Band testing.

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Ampex Military Products Company has developed an advanced magnetic-tape transport compatible with all members of the Army's Fieldata family of computers. The new system will be used "on-line" with the computers for input, output operations. The tape transport is completely transistorized like the computers, and is designed to be van mounted.

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Minneapolis-Honeywell Regulator Company has developed a potentiometer called the ElectroniK 17. The device incorporates an electro-mechanical strain gage as the rebalancing element. By eliminating the conventional slidewire, the number of points at which a potentiometer can come to balance is no longer limited to the convolutions on a slidewire.

Initial production of the new potentiometer, which can be mounted in a standard 19-inch relay rack, on a panel or bench, or made portable, will consist of a single pen strip and circular chart recorders and a circular scale indicator, each with or without control.

Other features incorporated in the ElectroniK 17 are: Isolation of all critical components within an electrical shield, thus rejecting stray signals that cause recording errors and affect the dynamics of the instrument; One true reference junction compensation for all types of thermocouple actuation; Transistorized plug-in control units up to a maximum of eight set points for auxiliary or zone control.

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The RD-900, a device created by Laboratory for Electronics, Inc., of Boston, has the ability to select information from its memory and immediately display it on a view screen. Information is retained in the system's storage file and can be displayed on the screen by an operator who uses a numerical index.

Such things as maps, charts, actual geographic pictures and information in alphabetic form can be clearly imposed and superimposed on the screen. As many as 50 million characters can be stored in a typical RD-900, the company states.

Kahn Research Laboratories of Freeport, L. I., is producing a new Single-Sideband Transmitter Adapter capable of operation from 1 to 50 megacycles.

The unit covers standard high frequency communications bands and makes practical high efficiency Class C single-sideband operation, utilizing the EER system for scatter transmission. The unit is based upon Adapters produced by Kahn. Existing or new AM transmitters may be adapted to produce peak envelope power of from 3 to 4 times their carrier rating for single-sideband operation, the company reports. Independent modulation of both the upper and lower sideband with reduced carrier levels operation is provided when the Model SSB-58-1B is used.

• • •

MacLeod Instrument Corporation, Ft. Lauderdale, Florida has developed a digital converter to convert the indication of conventional pointer type instruments such as pressure gauges, temperature indicators, flowmeters, voltmeters, and wattmeters for operation of standard digital readout equipment. The device is readily applied to instruments having circular scales but is not limited to this type the company reports. The pick-

off unit, being photoelectric, imposes no mechanical load on the measuring instrument.

• • •

The full text of a policy statement, *Growth and Taxes: Steps for 1961,* is available from the Committee for Economic Development (CED), 711 Fifth Avenue, New York 22, N. Y., at a cost of $1.00 per copy.

The committee calls for "reform of the Federal tax structure to increase the nation's rate of growth through a reduction of present inhibitions on productive activity." An eight-point program is suggested for specific and immediate changes in the tax law to "greatly improve the Federal tax system and would be consistent with whatever changes may be made at a later date."

CED is a group of 200 corporation executives and university presidents working together to conduct research and formulate policy recommendations on major economic issues, and to sponsor education on how the American economy operates.

• • •

Over one-hundred new developments needed by the Armed Forces are described in the *Inventions Wanted* publication just issued by the National Inventors Council, U. S. Department of Commerce. The current list of new devices and design improvements requested by the Department of Defense through the Council, covers all fields of scientific research.

For further information on this report write to Publications and Public Information Division, Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

Summary of Recommendations for Research and Development in Materials is a report compiled by the Defense Research and Engineering Office and is a summary of proposed new Defense research projects. The recommendations are derived mainly from specific panel studies conducted by the Department of Defense, as well as from reports of the Office of Defense Research and Engineering, the Materials Advisory Board of the National Academy of Sciences and others. Order PB 161-865 from the Office of Technical Services, U. S. Department of Commerce.

Climatic Charts and Data of the Radio Refractive Index for the U. S. and the World, by B. Bean, J. Horn and A. Ozanich, Jr., of the National Bureau of Standards is available from the Superintendent of Docu-

ments, U. S. Government Printing Office, Washington 25, D. C. for $2.00 per copy.

• • •

Amplitude-Probability Distributions for Atmospheric Radio Noise by W. G. Crichlow, A. D. Spaulding, C. J. Roubique and R. T. Disney, National Bureau of Standards Monograph 23, issued November 4, 1960 is 22 pages long and may be ordered from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Cost is 22 cents.

A series of standards to insure greater scientific accuracy through more uniform procedures and techniques in the use of laboratory instruments prepared by the Bureau of Naval Weapons is being published for the use of science and industry by the Office of Technical Services, Business and Defense Services Administration, U. S. Department of Commerce. The first 23 of approximately 300 standards in this series are now available. The remainder will be published by OTS during the year. The series is divided into three categories: Instrument Calibration Procedure, Cross-Check Procedure and Measurement System Operation Procedure. The standards may be ordered as a series of 23 for $11.50 or singly for 50 cents each. The series is *Standards Laboratory Procedure,* Bureau of Naval Weapons, 1960; order PB 171-200 through 171-222.

• • •

A publication listing all communications and electronics equipment operated by the Airways and Air Communications Service throughout the world has been released. The published document will be used in conjunction with a new Air Force wide inventory reporting system.

The new report will enable Air Materiel Command to program logistic support by presenting an accurate accounting of the in-use quantity of each kind of communications gear. AACS lists nearly 52,000 items of this equipment with a monetary value of $200,000,000 and uses the inventory reporting system to keep obsolete machinery at the lowest possible level.

Photoprogress

Exposure meters produced by Zeiss Ikon of Stuttgart, Germany, feature a temperature compensating circuit which minimizes and, in some instances, eliminates irregularities caused by high and low temperatures on electrical output. The circuit utilizes a thermistor system (a resistor with a negative temperature coefficient) which has a lower resistance when hot than when cold. This compensates the temperature variation of the photo-electric cell. The exposure meter reading thus becomes virtually independent of the prevailing temperature. The IKOPHOT exposure meter, as well as all meters built into Zeiss Ikon cameras, incorporates this feature for reliability and accuracy.

• • •

A self-shuttering electronic flash of high intensity has been developed by three scientists of the U. S. Naval Ordnance Laboratory, White Oak, Maryland. The flash instantaneously achieves and maintains the peak intensity of 10 press camera flashbulbs before suddenly shutting off without an afterglow.

The new electronic flash consists of a gaseous discharge tube coupled with an artificial transmission line made up of a number of capacitors. When the flash unit is used in a missile test, its charged capacitors are

discharged allowing alternating current to race back and forth through the transmission line. This keeps the tube's arc burning evenly for three one-thousandths of a second. At the end of this time, the voltage across the discharge tube abruptly drops to zero causing the light to immediately cease shining without any afterglow.

During the time a missile model is illuminated, a high-speed continuous writing camera takes 82 equally exposed pictures of it as it reacts to a shock wave. Data from these pictures help determine the aerodynamic stability of the full-scale missile represented by the model. Designers of the flash device are L. L. Hill, T. Marshall and B. J. Crapo.

• • •

The Traid 735 Wide Angle Lens is an unusually small lens with a 180° field of view. The miniaturized lens, primarily for use in drone scoring systems, was designed and manufactured by Traid Corporation specifications by Pacific Optical Co.

The Traid 735 has a focal length of 6.51mm, speed of f/6.3 and is in Eyemo mount. Distortion is very limited according to the Traid Corporation.

• • •

Photomechanisms, Incorporated of Huntington Station, New York is producing four models of cinefluorographic cameras. The camera is designed to photograph the light output of X-ray excited image intensifier tubes. X-ray motion pictures of the heart or other human internal organs in action are made possible by the camera which is available in 16 and 35 mm models.

The camera automatically cuts off radiation between pictures, thus holding to a minimum the X-ray dosage the patient receives. A quick change feature of the camera permits rapid selection of any one of four pictures from rates up to a maximum of 60 per second.

• • •

Expenditures for non-theatrical films and audio-visual material in the United States reached a record high in 1960.

The total outlay for the year in these fields was $389 million, a nine percent increase over 1959. The Journal of the Society of Motion Picture and Television Engineers reports that education registered the largest increase over 1959 expenditures—32 percent. Civic, social welfare and recreation groups gained 6.7 percent and expenditures for

business and industry were up 3.4 percent. Government and medical expenditures showed no appreciable change and those for religious groups decreased 5.2 percent.

• • •

Theme of the 89th Semiannual Convention of the Society of Motion Picture and Television Engineers is "International Achievements in Motion Pictures and Television." The Convention will take place May 7-12 at the King Edward Sheraton Hotel in Toronto, Canada. An equipment exhibit will accompany the 89th Convention.

On May 22 through 26, the Society of Photographic Scientists and Engineers will meet in the Arlington Hotel located in Binghamton, New York. New advances in color and black-and-white photography will highlight the main program.

• • •

Hico Corporation of Watertown, Massachusetts is marketing a new 200 watt/second portable electronic flash unit, the Model K, for professional and industrial, color and black-and-white photography.

The flash features a neon "Full Charge Indicator" that shows when a full regulated charge has been reached. The transistor regulating circuit assures constant light output from the first shot to the 100th shot on full power, as well as long standby time. According to Hico the recycling time on full power is only 8 seconds to ½ stop and 11 seconds to full charge.

Other Model K features include a built-in charger and ac operation, a 6 volt nickel cadmium battery, dual locking type outlets and a sealed lamp head with 50° beam.

• • •

A new 16mm film viewer available from the Geotechnical Corporation of Garland, Texas, features a motorized film drive, a remote operator control, and data magnified 20 times on a large viewscreen. Operators can locate data of interest by using a pushbutton to traverse the film in either direction at 120 cm/sec. The self-protecting film drive uses magnetic clutches to provide positive control and to enable film direction to be reversed without stopping the drive. The operator can study data in detail by varying the film speed continuously from 1.3 to 0 cm/sec. Controls are also provided for changing the direction of film travel, varying the light intensity, varying magnification between 19X and 21X, and for maintaining a continuous sharp focus. An optional remote control unit permits operation up to 10 feet from the large viewscreen.

Fifty to 200 foot film reels can be quickly changed on top of the viewer, the company reports. A film area of 14.5mm x 35mm is projected on the 27.5″ x 11.5″ viewscreen. Distortion is not more than ±1%. Three lines per mm can be resolved at screen center. Forced air cooling of the derated projection lamp provides maximum lamp lift. The weight of the cabinet is 125 pounds; dimensions are 31″ w x 27″ d x 23″ h. Power required is 115 v, 200 w, 60 cps.

Names in the News

Colonel Caesar Frank Fiore, USA (Ret.) was awarded a citation for meritorious service to the U. S. Department of Commerce. He is assistant to the vice president and director of marketing and commercial development of International Telephone and Telegraph Corp.

Bernard Pear, Rittenhouse-Claridge, has been appointed chairman, Signal Corps Logistics Evaluation Group.

William V. Kahler, president of Illinois Bell Telephone Co. (Chicago), received the 1961 Washington Award as the "engineer whose professional attainments have pre-eminently advanced the welfare of mankind."

Richard B. Bean has been appointed program manager, Systems Engineering and Management Operation, Sylvania Electronic Systems, a division of Sylvania Electric Products Inc.

Leonard Goldman has been elected a vice president of Intercontinental Electronics Corp., and will continue in charge of marketing.

John S. Ward has joined the Customer Relations Department, Military Products Division, Adler Electronics.

Colonel Francis N. Miller was appointed head of the field engineering section at the Electronic Defense Laboratories of Sylvania Electric Products Inc.

Rear Admiral Henry C. Bruton, USN (Ret.) has been named director, Fleet Communications Division, Alpha Corp.

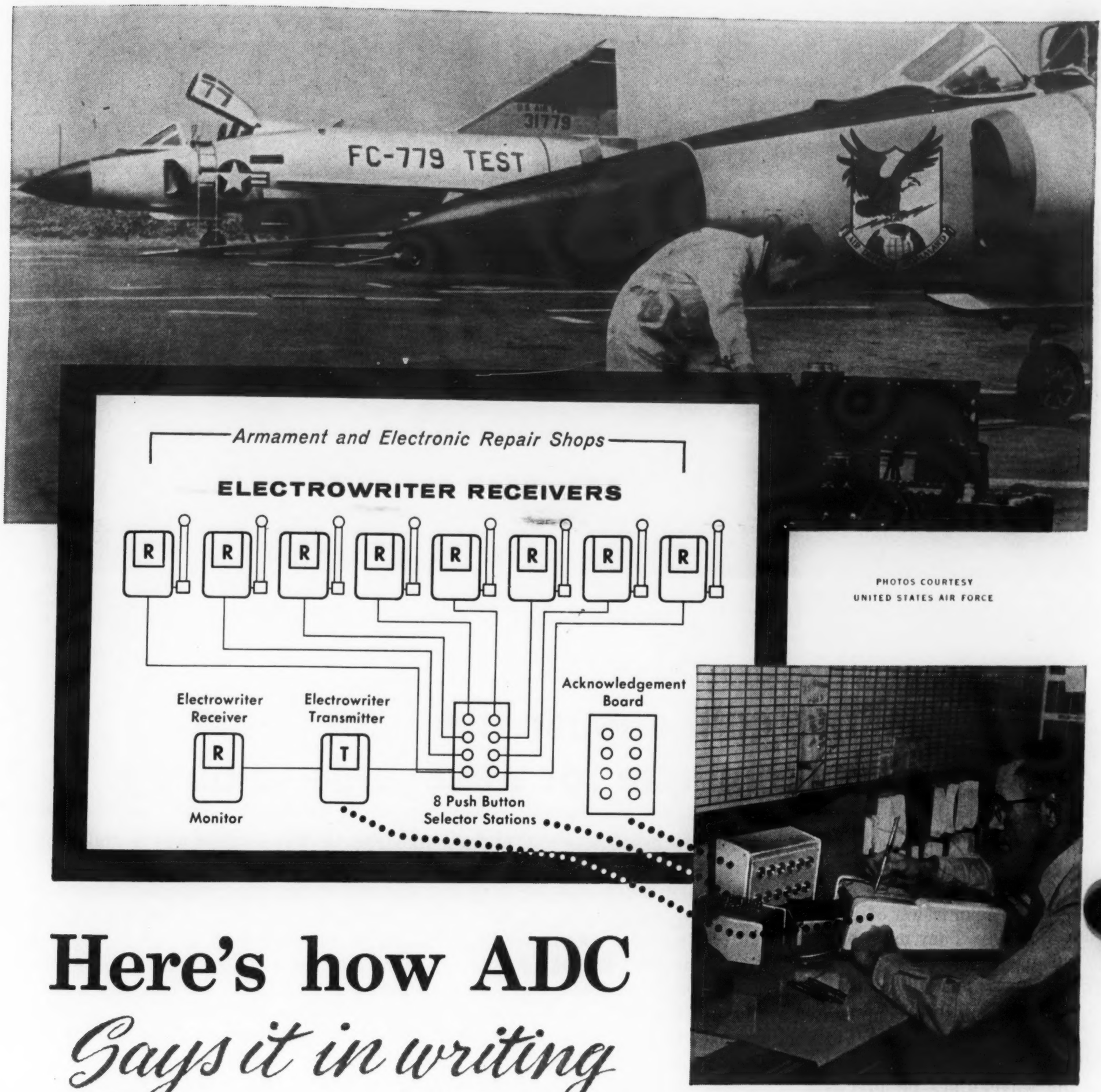
T. Keith Glennan, former head of the National Aeronautics and Space Administration, has been re-elected to the board of directors of Harris-Intertype Corporation.

Stanley I. Cohn, assistant director of electronics research, Armour Research Foundation of Illinois Institute of Technology, has been appointed chairman of the Radio Frequency Interference Committee of the Institute of Radio Engineers.

H. S. Stone, Jr., president of the newly formed MITE Corp., has announced the following company officers: **R. A. St. Clair**, vice president, manufacturing; **P. Phelps**, vice president, marketing; **J. E. Lockwood**, vice president, treasurer; **R. M. Hirsch**, vice president, marketing; **B. Howard**, vice president, research and development; **H. M. Greist, Jr.**, vice president; **R. J. Blinken**, vice president; **J. W. Cooper**, secretary.

John F. Gilbarte has formed a new Washington, D. C. firm, Continental Consultants, Inc. A former executive with Admiral Corp., Mr. Gilbarte has been responsible for buffet arrangements at the AFCEA Convention.

Lt. Gen. James M. Gavin has been appointed U. S. Ambassador to France. **Raymond Stevens** will serve as president and chief executive officer of Arthur D. Little, Inc. during his absence. **Albert E. Mignone** has been named vice president.



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The Air Defense Command, Hamilton Air Force Base, cuts manpower and time in processing vital aircraft maintenance instructions through the use of Electrowriter Systems. Writing directly on an Electrowriter Transmitter, Central Maintenance transmits a description of the maintenance requested by an incoming aircraft. A pushbutton selector chooses the stations to receive the message. At Hamilton, there are nine receiving stations for Field Maintenance and eight receiving stations for Armament and Electronic services. Each shop concerned with the maintenance required receives the instructions instantaneously, *as they are written.*

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1 Waveguide cross-section before cold-flanging process.

2 First punch gathers the copper under extreme pressure.

3 The second starts flaring the metal to form eventual flange.

4 The third punch flattens copper into shape of finished flange.

5 The fourth embosses and completes flange. Time: approx. 50 sec.

Making cold copper flow like liquid... a new technique for waveguide flanging

Waveguides — the metal tubes which carry microwave signals between an antenna and its transmitter or receiver — are used extensively in military radar and in the transmission of long distance telephone calls by radio relay. They must be manufactured to precise specifications, since a variation of only .003" in their interior dimensions will cause serious microwave distortion.

This problem is complicated by the fact that as many as 100 individual waveguides may be used in connecting radio equipment with its antenna. Thus, not only must the waveguides be precisely engineered, but the connecting points must be constructed so that they offer no interference with the interior dimensions.

Connecting two or more waveguides is accomplished by use of flanges, or rims, on the ends of the tubes. Formerly, these flanges were separately manufactured and manually joined to the waveguides. The process was slow and costly, so Western Electric engineers developed a means of forming the flanges from the ends of the waveguides themselves. In doing so, they accomplished a metallurgical feat never before approached.

As a first step, the possibility of heating the waveguides and molding the ends into flanges was tried. This idea was not pursued since the heated copper annealed and lost its strength. The solution was to make the copper flow without heat — to crush it at such great pressure that the end of the tube would fold back and out in a fluid movement — *and do so without changing the inside dimensions of the tube.*

Development centered around the design of four high-precision forming punches with two complementary forming dies. Each punch was planned to take a step in the redistribution of the copper, with the dies acting as forming molds. To achieve the exact pressure and punching sequence required, it was necessary to design and build a special hydraulic press.

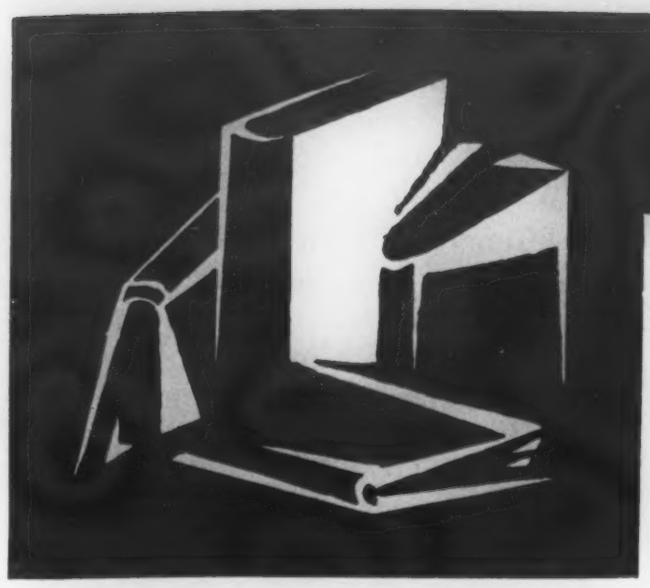
Here's how the process works: A waveguide is held in a fixed position in the press while the punches move in, out, and around, controlled by a revolving index head. The result of each punching stage is illustrated above.

This is believed to be the first time that precision metal tubing has been cold-flanged without distorting its configuration, and the first time that anyone has automatically produced waveguide flanges. The savings in time, labor and materials are substantial.

This break-through in metal-working, with all its many possibilities in other fields, is another example of Western Electric's progress in engineering developments.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM



Books

ABANDONED, The Story of the Greely Arctic Expedition 1881-1884, by A. L. Todd. McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y. 36, 1961. 323 pages, $5.95.

Reviewed By
Dr. George Raynor Thompson
Chief
Signal Corps Historical Division

Just 80 years ago, in 1881, a serious, studious Signal Corps lieutenant, fired with zeal for Arctic exploration, led an Army party into the Far North, to explore terrain, sea and weather and to maintain a record of scientific observations during the International Polar Year, actually the first IGY. A self-made man, trained in leadership both by his Civil War service (twice wounded) and by subsequent assignments in the Far West erecting military telegraph lines, the iron-willed Lt. Adolphus Washington Greely, led a group of volunteers (2 other officers, 19 enlisted men, a civilian doctor, and 2 Eskimos) on a hazardous venture to the northern end of Ellesmere Island, within 500 miles of the Pole. Some were as ambitious as himself to make a name in polar exploration, notably the doctor on contract with the Army, an erratic adventurer, Octave Pavy. Others like Lt. Frederick F. Kislingbury, wished to escape an unhappy past. One, Pvt. Charles B. Henry, was a man with a criminal record—a fact unknown to Greely but which was learned in the War Department after the expedition had sailed. Yet others were dependable men, some with solid Army experience like Lt. James B. Lockwood and Sgt. David L. Brainard; some with civilian background only, like George W. Rice, a photographer who was given a sergeant's rating for the duration of the trip—a man who would prove a tower of strength, except for one lapse when he was temporarily taken in by an attempted mutiny.

For mutiny came near occurring more than once in this party that lived in Ft. Conger on Lady Franklin Bay in the late summer of 1881, close by a vein of essential fuel coal. During two years they explored the desolate terrain from that base and there they maintained a faithful routine of scientific recording. For two long years they worked well, through their first summer in the Far North, 1882, when a resupply ship failed to reach them, blocked by ice, and far into the second summer, 1883, when the ship that was to take them all back home failed to penetrate the ice barriers. The vessel was in fact caught and crushed in ice floes many scores of miles short of Ft. Conger. The crew with difficulty escaped down the Greenland coast in small open boats, leaving a few hundred rations at Cape Sabine in case Greely came that way. He did come—in October, but the food cache was far too small.

The tragic yet heroic story of what then befell Greely and his men—as first they sought to escape late that summer (1883) struggling southwards in small boats till compelled to drift with the ice flows, and finally as they had to winter at Cape Sabine in dire circumstances—is the subject of a soul-searing story narrated in the book *Abandoned* by A. L. Todd.

Mr. Todd when a boy met Greely and was fascinated by the monumental old general and the facts and fables told of him. Recently discovering a quantity of Greely's papers, hitherto unrevealed, he wrote the book from these and other records which include the diaries which several members of the party maintained day by day. The story is all fact. Not a word of it is fiction. Todd regards his book as adventure-history. He tells the story objectively, factually. No dressing up is needed. The fast-moving account holds the reader with rapidly alternating scenes of horror and heart-rending tragedy, of heroic strength and sacrifice, of admiration for Greely's young wife who never gave up hope nor ceased goading a shamefully reluctant Secretary of War and other government officials whose efforts to accomplish rescue seemed half-hearted or worse (Congress even debated the costs and worth of rescue effort).

Meanwhile, the Greely Expedition, its certain vicissitudes and uncertain fate, won world-wide notice and concern. And while the debates dragged on in the U. S. Congress, on Ellesmere Island in a miserable dank cold hovel at Cape Sabine, the expedition members lay dying one by one during the winter and spring of 1884.

On 22 June 1884 the remainder were found by a rescue fleet promoted especially by the Secretary of the U. S. Navy, William E. Chandler, and led by Commander Winfield S. Schley (even the British in their sympathetic concern contributed a ship to this rescue effort). The remainder were seven men, only one or two able to stand or stumble—all were within a few days of death. One did die on the return trip.

All the scientific records of the expedition were returned intact. The party had maintained them continuously up to within the last few weeks. The U. S. contribution to the International Polar Year was faithfully carried out as Greely had planned, as he had determined to accomplish in full though death might claim all the members of his group.

As the mingled joy and sadness of the rescue news stirred the world in the summer of 1884, a ghastly note suddenly broke into the newspapers. Several of the dead showed indications of cannibalism. An autopsy of Kislingbury showed portions of his flesh cut away, and there appeared to be grisly evidence in his digestive tract that he too had eaten human flesh. The corpse of one man, the miscreant Pvt. Henry, showed two bullet wounds. Greely had had to order him shot in early June for stealing food supplies.

Greely, one of the six survivors, stated that he knew nothing of the cannibalism. He had been confined to his sleeping bag the last weeks from a failing heart and extreme weakness. All the survivors swore, like Greely, that they were innocent. But none could know for sure what was locked up in their memories.

Yet strong support of the survivors' oaths has unexpectedly developed out of the impartial record in Mr. Todd's book. The renowned Arctic explorer and scholar, Vilhjalmur Stefansson, in his introduction to the book brings out a remarkable observation which he himself had never thought of till he read the details which Todd has unearthed and vividly set forth in *Abandoned*. It is the fact of protein poisoning, or "rabbit starvation," long known to many of the hardy men of the North. It simply is that men can live 6 to 8 weeks without food. But if they eat animals already dead, or dying, of starvation, they will live only 3 to 4 weeks. Reasonably strong till near the end, they suddenly break down and perish in a few days. The fatless tissues of the starved is in effect a

poisonous food. Todd's account of the sudden deaths of a number of Greely's men in the terrible winter and spring of 1884 fits the circumstances of protein poisoning. The flame of life, though it flickered low, lingered longer in those who did not break the taboo, who did not eat human flesh. The deeds and words of Lt. Greely stand vindicated.

Abandoned is a gripping book. It should be read by those concerned with Army Signal Corps history in particular and with the nation's Arctic and scientific efforts in general. Greely, obviously a controversial figure, whose admittedly irritable nature, determined perfectionism and ambition, perhaps produced nearly as many enemies as friends, became Chief Signal Officer of the Army in 1887. He succeeded another strong Chief Signal Officer, Brig. Gen. William B. Hazen, a Civil War commander of brilliant combat record and a fighter also for Greely's rescue (his criticism of Secretary of War Robert T. Lincoln led to a court martial for himself, but a moral victory for the Corps and the Expedition). Greely remained a vigorous progressive Chief for 19 years, and then served final assignments as Major General in command, variously, of the Army's Pacific Division, the Northern Division, and various western departments, 1906-1908.

Gen. A. W. Greely was honored more in Europe, than in his native land as an outstanding explorer and devoted self-educated scientist. It is time that his fellow Americans recognize his stature and discount much of the ill that was long whispered against him. The record contained in *Abandoned*, undoubtedly the most careful and complete account of the Greely Expedition, gives us a magnificent measure of the man.

THIS WAS AIR TRAVEL, by Henry R. Palmer, Jr. Superior Publishing Co., P. O. Box 1710, Seattle 11, Washington, 1960. $11.95.

This book offers more than 300 pages of historic photographs and text tracing man's efforts to fly. Some of the highlights covered in this highly interesting book are Balloons and Blimps; Great Day at Kitty Hawk; Farman, the Airman; Roger Sommer Sets Record; Martin's First "air yacht"; Tampa to St. Pete in 20 minutes; Sweet Dreams on the Condor; Boeing Packs the Mail; Ryan and Douglas Firsts; Hindenburg Elegance, and so on.

PRECISION MEASUREMENT AND CALIBRATION, by National Bureau of Standards. Three Volumes, 1961.

NBS has submitted for printing a three-volume compilation of its more important publications dealing with precision measurement and the calibration of standards. These publications were originally issued over a period of years as circulars, research papers, chapters of books and articles in scientific periodicals, and, as separate documents. The three volumes are: Volume I—*Electricity and Electronics*, 845 pages, $6.00; Volume II—*Heat and Mechanics*, 965 pages, $6.75; Volume III—*Optics, Metrology, and Radiation*, 1,025 pages, $7.00.

Advance orders are now being accepted for the three volumes which will be available early this year. Make all checks and money orders payable to the Superintendent of Documents and mail to Chief, Special Service Section, P. O. Box 1533, Washington 13, D. C.

INSTRUMENTATION AND HIGH-SPEED PHOTOGRAPHY, Volume I, Series II. The Society of Motion Picture and Television Engineers, 55 W. 42nd St., N.Y. 36, N.Y., 1960. 187 pages, $4.00.

This book represents a compilation of papers reprinted from the SMPTE Journal and adds to the more than 1000 pages on this subject published by the Society in Volumes I through VI of the first series.

The book includes a discussion of the design of underwater automatic and controlled cameras, and a color illustrated paper on submicrosecond color photography of explosive phenomena. An article on ultra-cold weather photography describes the U. S. Navy's use of still and motion-picture cameras in cold weather and their application on Operation DEEP-FREEZE. Included in a series of papers on missile photography is a discussion of flying camera stations used to obtain attitude, trajectory and documentary data of missiles launched from aircraft at high altitudes.

THE GREAT SEA WAR, edited by E. B. Potter and Admiral Chester W. Nimitz, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1960. $7.95.

A noted naval historian and one of the great heroes of World War II have prepared a complete and accurate one-volume history of naval action in that war. *The Great Sea War* contains a large number of diagrams, maps and charts that illustrate the various battles and campaigns. Information on specific phases of the sea war was supplied by General of the Army Douglas Mac Arthur, the late Grand Admiral Erich Raeder. Admiral Arleigh Burke, General Thomas Holcomb and others, including representatives of the British, French, German and Italian navies.

ELECTRONICS AND NUCLEONIC DICTIONARY, by Nelson Cooke and John Markus, McGraw-Hill Book Co., Inc., 327 W. 41st St., N.Y. 36, N.Y., 1960. 543 pages, $12.00.

More than 13,000 terms used in the electronics and nucleonics fields are defined in this dictionary. Exact meaning and correct usuage are given of technical words, synonyms and abbreviations currently being used in areas such as radio, radar, industrial electronics, medical electronics, avionics, space electronics, nuclear science and nuclear engineering.

More than 450 illustrations further clarify and expand the meaning of complex terms, and show examples of typical circuits and devices.

RUSSIA, by Charles W. Thayer and the Editors of LIFE. Time Incorp., Rockefeller Center, N.Y. 20, N.Y., 1960. 160 pages, $2.95.

The first volume of the *Life World Library* is the authors' appraisal of the Soviet Union. Through text, paintings and photographs a broad, useful picture of Soviet life, embracing a variety of aspects, is provided.

In addition, the book should be useful as a reference work with its maps, diagrams and basic statistics.

ARMOR—A History of Mechanized Forces, by Richard Ogorkiewicz. Frederick A. Praeger, Inc. 64 University Place, N. Y. 3, N.Y., 1960. $7.95.

A definitive and comprehensive history of armored and mechanized warfare is given here—from the first chariot to the M60 tank. Included are: the ancestry of armor, beginning with the Sumerian cart in 3500 B.C.; the forerunners of the modern armored vehicle, including the steam tractor and the Little Willie; the work of designers such as J. Walter Christie and strategists such as Fuller, Guderian, and Liddell Hart; the details of major types of modern armor including technical problems and strategic use; and, the role of armor on a nuclear battlefield.

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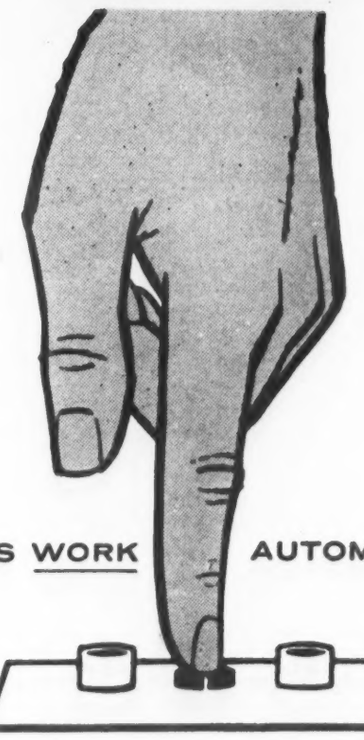

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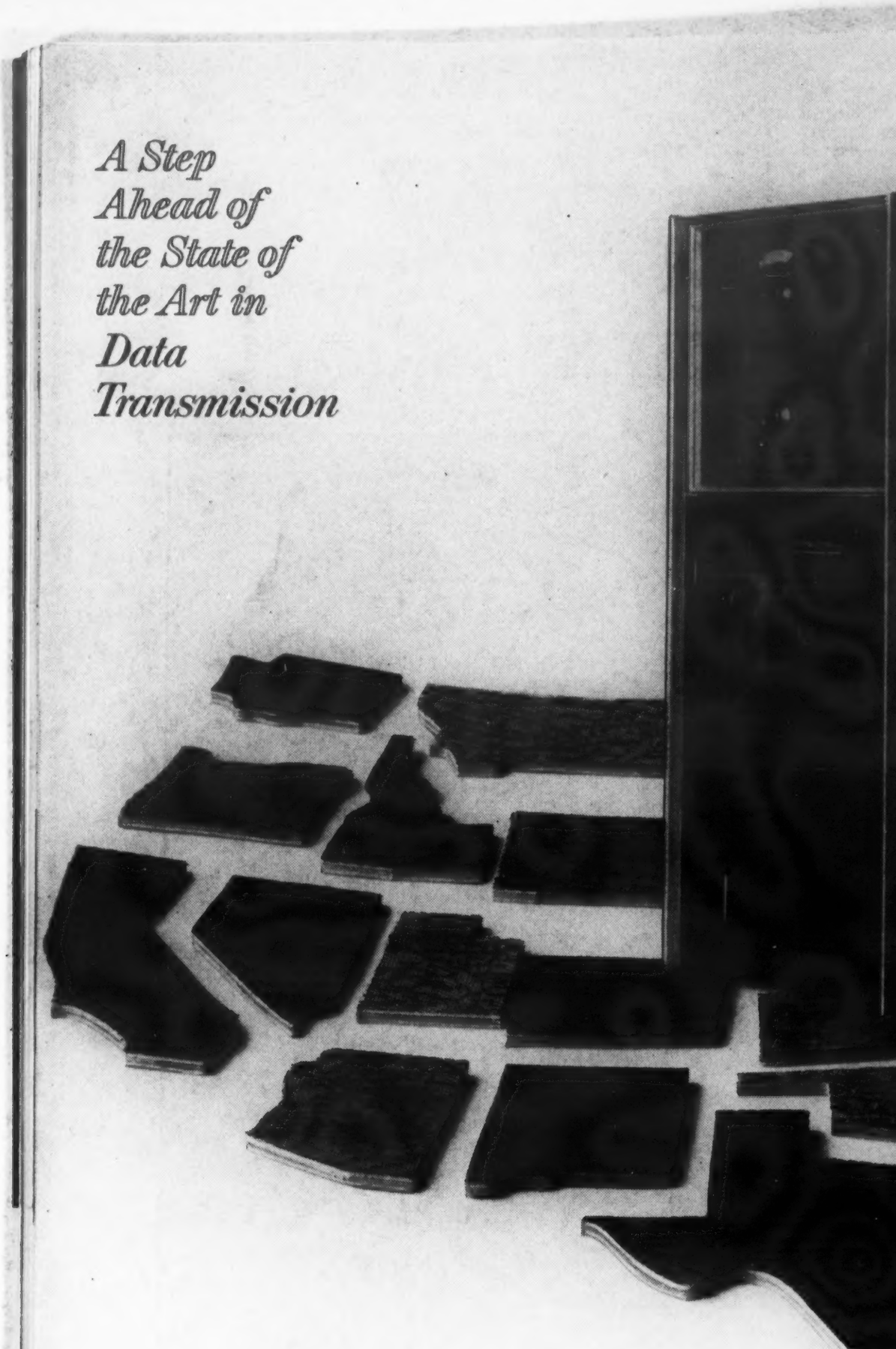

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